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Installation Restoration Program

Phase I-Records Search Newark AFS, Ohio

April 1985

Prepared for:
United States Air Force
HQ AFLC/DEPV
Wright-Patterson AFB, Ohio

RADIAN
CORPORATION

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INSTALLATION RESTORATION PROGRAM

PHASE I: RECORDS SEARCH

NEWARK AFS, OHIO

Prepared by:

Radian Corporation
7655 Old Springhouse Road
McLean, Virginia 22102

April 1985

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TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

A. BACKGROUND

1. Radian Corporation was retained on 1 June 1984 to conduct the Newark Air Force Station (NAFS) Installation Restoration Program Phase I Records Search under Contract No. F08637 83 G0008 5003, with funds provided by the United States Air Force.

2. Defense Environmental Quality Program Policy Memorandum 81-5 explains the Department of Defense (DOD) policy, which is to identify and fully evaluate suspected problems associated with past hazardous waste management practices on DOD facilities and to control the migration of hazardous constituents that could endanger health and welfare.

3. To implement the DOD policy, a four-phase Installation Restoration Program (IRP) has been directed. Phase I, the records search, is the identification of potential problems. Phase II, if required, (not part of this contract) consists of follow-on field work to determine the extent and magnitude of contaminant migration. Phase III, if required (not part of this contract) consists of technology development (research and development effort only when required). Phase IV, if required (not part of this contract), is the development and implementation of selected remedial actions.

4. The Newark AFS Phase I Records Search included a detailed review of pertinent installation records; contacts with 13 representatives of local and regional regulatory agencies, and an on-site visit conducted by Radian 17-21 September 1984. During the station visit, interviews were conducted with 34 past and present installation employees and ground tour of installation facilities and all identified sites of potential environmental contamination were accomplished.

B. MAJOR FINDINGS

1. Since 1962, many hazardous and potentially hazardous wastes have been generated by industrial operations in Building 4 at Newark AFS. Dirty freon is recycled through a recovery still inside the building and reused. The still is an integral part of the process of using the freon. It is piped from a storage tank to its use point, then back to the still and back to the storage tank. Still bottoms are used for rough cleaning. Nonrecoverable spent solvents are disposed of off-station through Defense Property Disposal Office (DPDO).

2. A beryllium dust collection system is located on the east side of Building 4. The collected dust is encapsulated in cement and sent off-station for disposal.

3. There is one inactive fire training area on the installation. No hazardous materials were ever burned there. There is no currently active fire training area.

4. One inactive landfill area was identified. No hazardous materials were placed there. There are no currently active landfills on the installation.

5. There are ten fuel storage tanks on the installation; nine of them are in-service. No leaks were reported for any of the tanks.

6. Twelve hazardous materials storage or staging areas were identified. Two of them are scheduled to be inactived in the near future. No spills were reported at any of the storage areas.

7. During interviews, it was determined that large quantities of dirty freon had been dumped along the entire perimeter fence line and in particular two specific locations. It was estimated that 15,000 to 20,000 gallons were dumped between 1973 and 1980, with the majority being dumped prior to 1977. The exact quantities were disputed in interviews, some estimates of the quantity of freon dumped were significantly lower.

8. An additional spill site was located in the area at the northeast corner of Building 4 near the location of the virgin freon tanks. An unknown amount of spent battery acid and spent solvents were spilled in this area between 1962 and 1964.

C. CONCLUSIONS

1. Review of the comprehensive data base assembled for the Phase I study resulted in identification of sites of potential contamination at Newark AFS.

2. Four of these sites were ranked using the Hazard Assessment Rating Methodology (HARM) based on their potential for migration of hazardous constituents.

3. Table 1 presents the four HARM-rated sites with their final HARM scores, and their potential risk rating.

D. RECOMMENDATIONS

1. A staged program of Phase II activities is recommended for Newark AFS. In Stage 1, three ground-water samples (one from each of the sumps in Building 4), three well water samples (one from each on-site well), and two soil boring samples (one from each dirty freon spill site) should be collected. The recommended sample collection locations are shown on Figure 1.

TABLE 1. POTENTIAL RISK RANKING BASED ON FINAL HARM SCORES

Site Number	Description	Final HARM Score	Potential Risk
SP-2A	Dirty freon spill, southeast side of Building 4	72	High
SP-2B	Dirty freon spill, Visitors and Contractors Parking Area	69	
SP-1	Spent battery acid and spent solvent spill, northeast corner of Building 4	58	Moderate
AT-1	Acid storage tank	53	Low

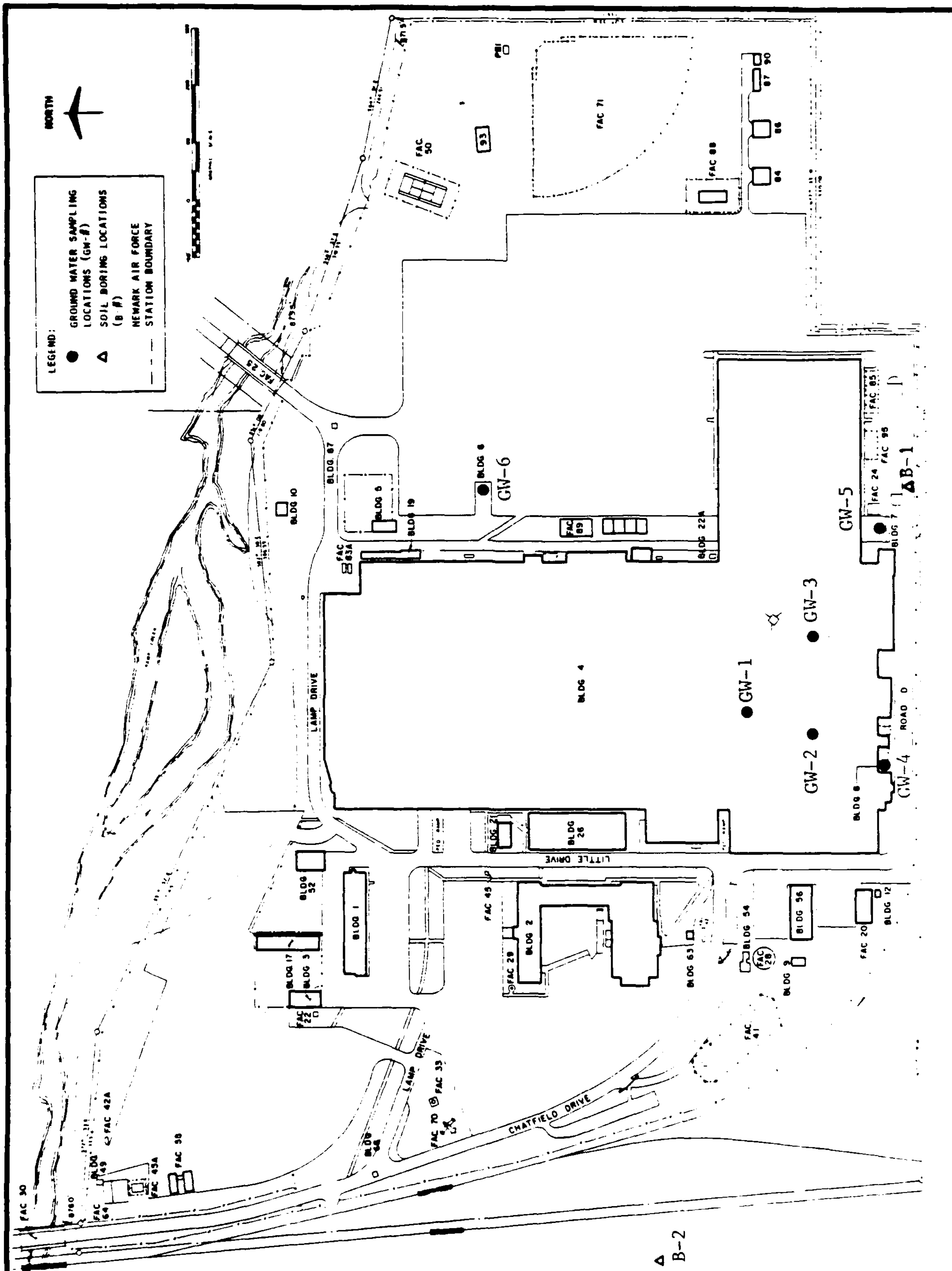


Figure 1. Recommended Sample Collection Locations, Newark AFS, Ohio

2. All of the samples should be analyzed for acetone, methylene chloride, Freon 113 (trichlorotrifluoroethane), toluene, 1,1,1-trichloroethane, xylene and total organic carbon (TOC). The analysis should be done in accordance with the specifications of EPA SW-846 (U.S. EPA, 1982). Method 8240, including the purge and trap, should be performed for the volatile organics and Method 9060 should be performed for TOC. In addition, special sampling techniques may be required to collect the soil borings for analysis of volatile organic compounds.

3. If the specified pollutants are detected at significant levels in the samples, Stage 2 activities will be needed. These may include the placement of monitoring wells and/or additional soil borings as appropriate.

4. Collection and analysis for the specified pollutants of the three ground-water samples and the three well water samples should become a part of the annual monitoring program.

I. INTRODUCTION

A. Background

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations which require disposers to identify the locations and contents of disposal sites and to take action to eliminate the hazards in an environmentally responsible manner. The primary federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Sections 6003 and 3012 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and state agencies to inventory past disposal sites and make the information available to the requesting agencies. The Department of Defense (DOD) Installation Restoration Program (IRP) assures compliance with these hazardous waste regulations. The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP is the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316, and 40 CFR 300 subpart F (National Contingency Plan). CERCLA is the primary legislation governing remedial action of past hazardous waste disposal sites.

To conduct the IRP Hazardous Materials Disposal Sites Records Search for the Newark AFS Installation, Radian Corporation was retained on 1 June 1984 under Contract No. F08637 83 G0008 5003.

There are four phases to the IRP. The records search comprises Phase I. During this phase, installation records are reviewed to identify possible hazardous waste-contaminated sites and to assess the potential for contaminant migration. Only Phase I activities are covered in this report. Phase II of the IRP consists of follow-on field work to determine the extent and magnitude of contaminant migration. Phase III consists of technology development (R&D effort only when necessary). Phase IV includes the development and implementation of a remedial action plan.

B. Purpose

The purpose of the Phase I records search is to identify past hazardous materials disposal and spill sites and assess the potential for contaminant migration from these sites. The existence of and potential for migration of hazardous material contaminants were evaluated at Newark Air Force Station (AFS) by reviewing Air Force supplied data, technical reports, and conducting interviews with past and present base personnel and regulatory officials familiar with Newark AFS. This report addresses the history of operations, the geological and hydrogeological conditions which may directly influence migration potential, and the ecological setting of the facility.

C. Scope

Phase I activities included:

- Reviewing site records;
- Interviewing personnel familiar with past generation and disposal activities;
- Compiling an inventory of wastes;
- Determining quantities and locations of current and past hazardous waste storage, treatment and disposal;
- Defining the environmental setting at Newark AFS;
- Reviewing past disposal practices and methods;
- Gathering information from state, local and federal agencies;
- Assessing the potential for contaminant migration; and
- Recommending, if required, follow-on activities.

The pre-performance meeting was held at Newark AFS on 12 July 1984. Representatives of the Air Force Engineering and Services Center (AFESC), Air Force Logistics Command (AFLC), Newark Air Force Station, Wright-Patterson Medical Center, and Radian attended the meeting. The purpose of the pre-performance meeting was to provide detailed project instruction to the Radian project team. The AFESC and AFLC representatives provided clarification and technical guidance and defined the responsibilities of all parties participating in the Newark AFS Records Search.

The on-site installation visit was conducted by three Radian technical staff members from 17 September through 21 September 1984. Activities performed during the on-site visit included a detailed search of installation records, ground tour of Newark AFS, and interviews with past and present base personnel. The following individuals comprised the entire Radian Phase I Records Search team:

1. Francis J. Smith, Program Manager, M.S. Sanitary Engineering;
2. Michael A. Zapkin, Project Director, M. Eng. Environmental Engineering and M.S. Biology - Team Chief and Ecologist;
3. Andrew M. Oven, M.S. Environmental Engineering - Hydrogeologist and Environmental Engineer; and
4. Lori L. Stoll, M.S. Chemical Engineering - Chemical Engineer.

Resumes of team members are included in Appendix A.

The principal Air Force representative who assisted in the Newark AFS study represented Station Engineering, Engineering and Construction Branch (Installation Point of Contact). Additional station personnel who provided support include the Industrial Hygienist, the Public Affairs Officer, and the Historian.

D. Methodology

The methodology for the Newark AFS records search is shown graphically in Figure I-1. The first step was a review of past and present industrial operations. This allowed the identification of waste stream contents and

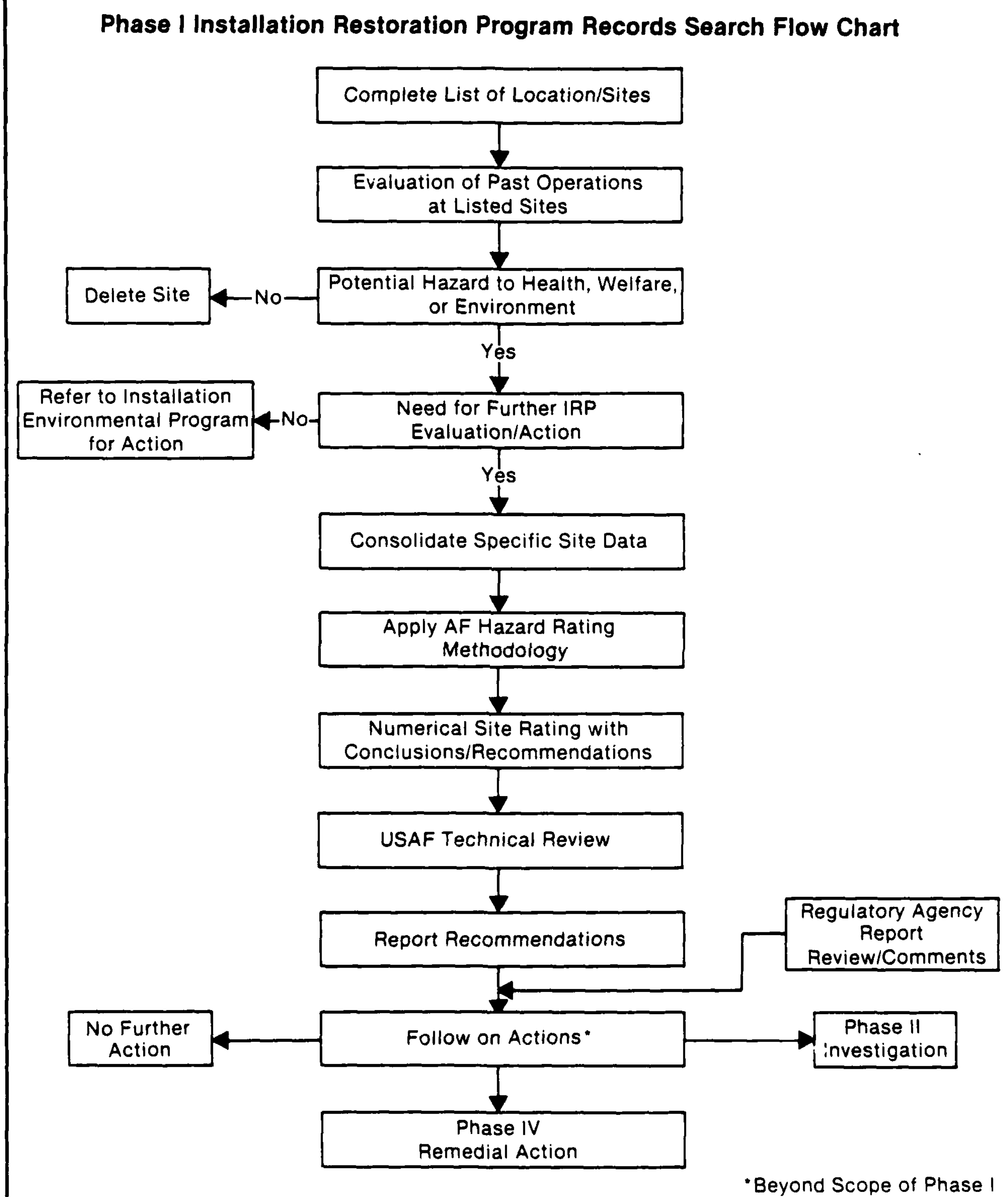


Figure I-1. Installation Restoration Program Phase I Decision Tree.

quantities. Information was obtained from records such as hazardous waste disposal permits, supply issue lists, station historical files, and from relevant industrial hygiene files.

The second step was to define and evaluate past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the industrial operations identified in Step 1. At this stage, sites of former landfills, storage areas and tanks were identified. Other potentially contaminated sites, such as the locations of spills of waste oils and solvents were determined.

The Records Search team conducted a detailed ground tour of the station. The team looked for any evidence of environmental impact, such as vegetation stress or disrupted topography. It was during this on-site visit that interviews with past and current station employees occurred. A list of interviewees and outside agency contacts is presented in Appendix B.

At this point a number of decisions were made. The first decision pertained to the potential for contamination of each site. If it was determined that the site was potentially contaminated, tnen the potential for migration of hazardous constituents from the site was evaluated. The site was rated using the Air Force Hazard Assessment Rating Methodology (HARM). This rating system results in a single score for each site which is based on evaluation of factors such as waste type and quantity, receptors, and pathways. This allows the relative ranking of sites with different environmental settings and waste characteristics. Following the hazard rating, recommendations for follow-on activities were made. Recommendations may vary from no action to a complete monitoring and sampling program for those sites receiving a high HARM score. A limited Phase II program may be recommended for sites receiving a moderate HARM rating to confirm that hazardous materials are not migrating from the site. The site rating methodology is described in Appendix C.

II. INSTALLATION DESCRIPTION

A. Location, Size, and Boundaries

Newark Air Force Station is geographically located in the center of the state of Ohio, in the county of Licking, within the city limits of Heath. Figure II-1 shows the regional and area location of the station. The city of Heath is approximately two miles south of the city of Newark and 35 miles east of the city of Columbus.

Newark AFS covers 56 acres. Figure II-2 shows the layout of the station. A building and facility listing is presented in Table II-1. The majority of the land holdings are improved grounds on which the main building and adjacent facilities are located. Less than 10 percent of the area is considered semi-improved grounds. Land use immediately around the base includes industrial development to the northwest and south, farming to the west, and a residential district to the northeast, which includes the Licking County Airport.

B. Organization and Mission Summary

The facilities at the Aerospace Guidance and Metrology Center were built in the early 1950s. In 1952, the Air Force contracted Kaiser Aluminum and Chemical Corporation to construct and operate giant aluminum presses near its Newark, Ohio plant as part of the Air Force Heavy Press Program. Plans were made to install presses of 25,000 and 35,000 tons capable of stamping out aircraft wing spans 35 feet long in a single operation. In July 1953, the Heavy Press Program was curtailed because of an economy move, technological progress, and a defense emphasis shift towards missiles. However, since the plant was partially built, the Air Force decided to complete the construction of the facility. Finished in June 1954, the Air Force utilized the new structure as an industrial equipment storage facility and designated it Air Force Industrial Plant Number 48.

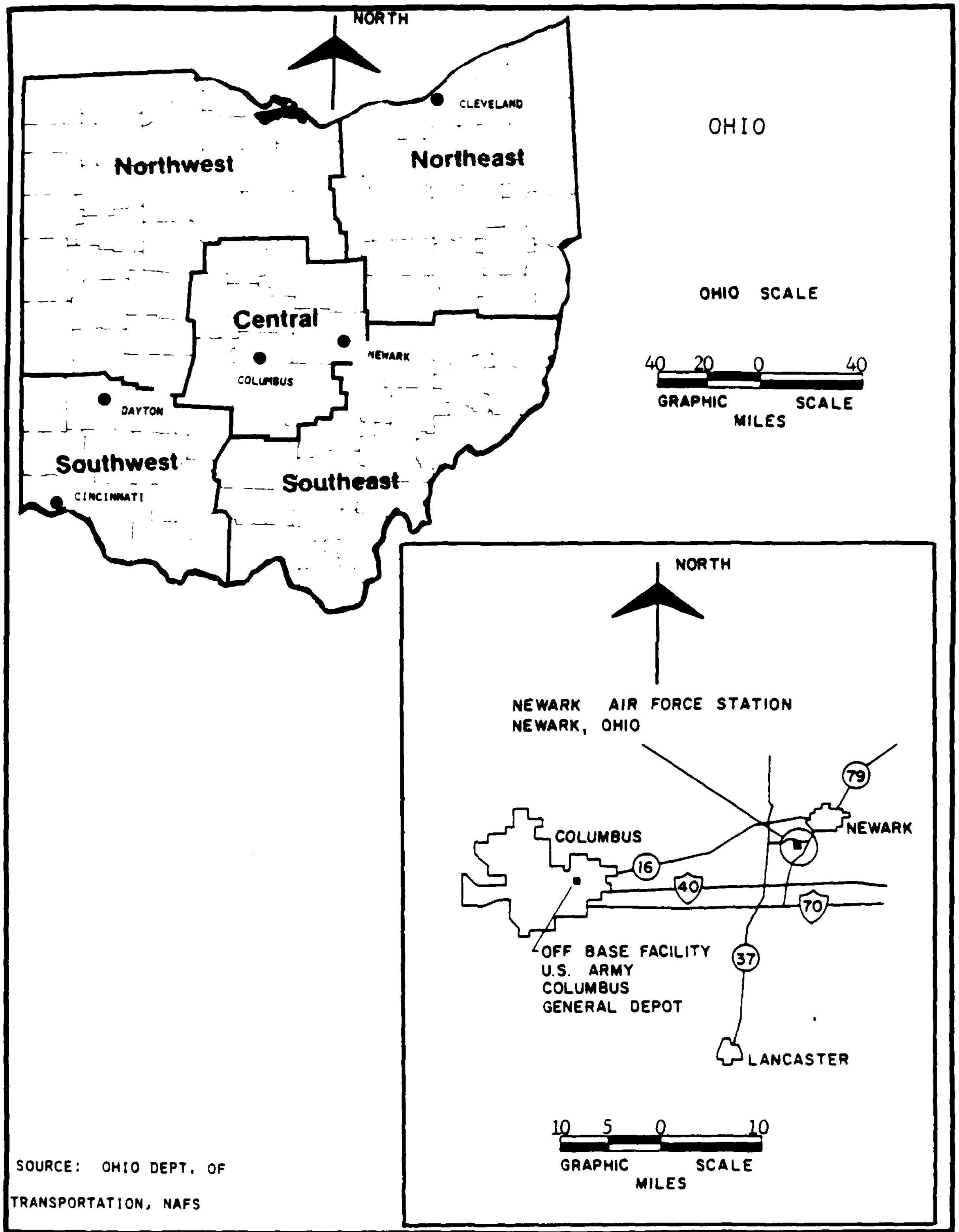
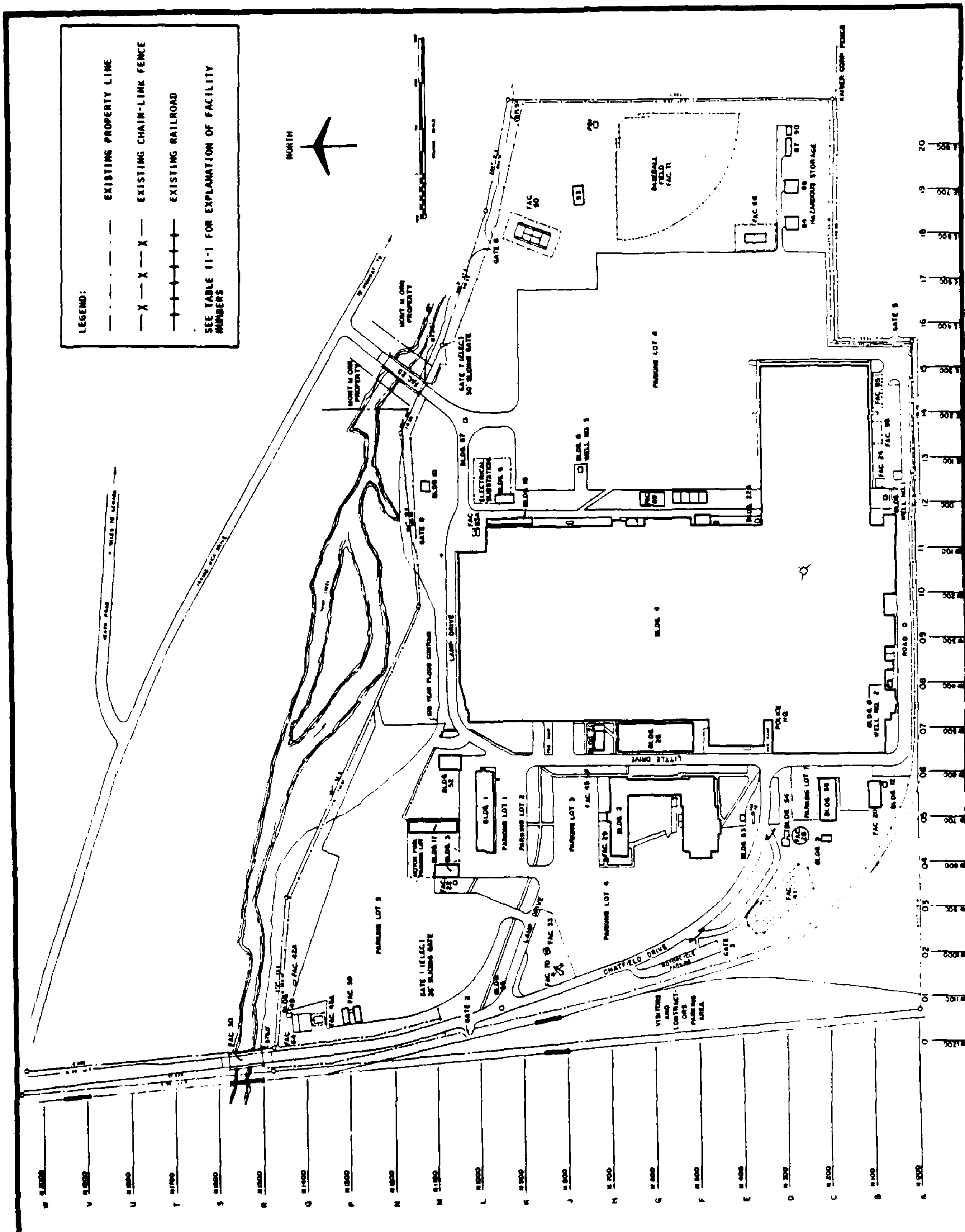


Figure II-1. Regional Setting, Newark AFS, Ohio



Source: NAFS, Ohio

Figure II-2. General Layout of Newark AFS, Ohio

TABLE II-1. IDENTIFICATION OF BUILDINGS AND FACILITIES AT NEWARK AFS, OHIO

Building/ Facility	Location	Description of Current Use
1	L-5	Pass and Identification, Branch Exchange, Medical Aid Station
2	F-5	Command Post, Cafeteria, Personnel Office, Contracting Office
3	M-4	Vehicle Maintenance Shop
4	G-9	Industrial Operations Facility, Metrology Labs
5	K-12	Electrical Power Substation
6	J-13	Drinking Water Well #3
7	B-12	Drinking Water Well #1
8	B-8	Drinking Water Well #2
9	C-5	Civil Engineering Paint Storage
10	M-13	Pavement and Grounds Equipment Storage
12	B-6	Security Police Storage Area
17	M-5	Motor Pool Parking Shed
19	K-12	Roads and Grounds Equipment Storage
20	B-5	Pest and Weed Control Equipment Storage and Preparation Area
21	H-7	Racquetball Court
22A	E-12	Air Compressor
22	M-4	Oil-Water Separator
24	B-12	Open Structure for Empty Drum Storage (Wooden)
25	N-15	Road Bridge
26	G-7	Gymnasium, Basketball Court
28	D-5	Water Tower
29	H-4	Flag Pole
30	R-0	Road Bridge
33	J-2	Missile Monument
41	D-3	Propane Tanks and Auxiliary Equipment
42	E-5	Underground Gasoline Tanks (In Use)
42A	Q-1	Underground Gasoline Tank (No Longer In Use)
45	H-6	Pump Station
45A	Q-1	Sanitary Sewer Pump Station
49	Q-1	Pesticides Storage Area
50	K-18	Tennis Court
52	M-6	Hazardous Storage Area for Acids and Flammable Liquids
54	D-4	Stellar Observatory; Used for Calibration with the North Star
55	P-1	Headquarters Group
56	C-5	Fire Station
63	E-5	Gas Station
66	K-1	Entrance Traffic Security Check House
67	L-14	Entrance Traffic Security Check House
70	J-2	Airplane Monument
71	G-20	Baseball Field

TABLE II-1. IDENTIFICATION OF BUILDINGS AND FACILITIES AT NEWARK AFS, OHIO (Continued)

Building/ Facility	Location	Description of Current Use
83A	L-12	Virgin Freon Storage Tanks (Above Ground)
84	D-18	Bulk Flammable Liquids Storage (New Chemicals)
85	B-15	RCRA Permitted Storage Area for Waste Chemicals
86	D-19	Gas Cylinder Storage Area
87	D-20	RCRA Permitted Hazardous Storage Area for Flammable Liquid Wastes
88	D-18	Trailer for Calibration of Radioactive Sources
89	G-12	Underground Heating Fuel Oil Tank, 20,000 Gallons
90	D-20	Staging Area for Collection of Contaminated Flammable Liquids
93	H-19	Picnic Area
95	B-14	Fenced Outdoor Storage Facility

In 1958, Air Force personnel assigned to Gentile Air Force Station in Dayton, Ohio took new interest in Air Force Industrial Plant Number 48. They believed the 65 foot deep pits with concrete walls ranging from 4-12 feet in thickness would be suitable to house laboratories for the growing Air Force Metrology and Calibration Program. In addition, the 400,000 square feet of open production area in Building 4 (the main production building) would provide adequate space for the proposed inertial guidance system repair facilities.

In February 1959, Air Force Industrial Plant Number 48 was redesignated the Heath Maintenance Annex of Dayton Air Force Depot. From 1961 to 1962, the facility was modified to house the new workloads. The first group of Dayton workers arrived in April 1962 and by June there were nearly 1,000 employees at the Annex.

On 11 June 1962, Headquarters Air Force Logistics Command designated and organized the 2802d Inertial Guidance and Calibration Group at the Heath Maintenance Annex. On 7 November 1962, the Heath Maintenance Annex was redesignated Newark Air Force Station. As a result of a reorganization, the 2802d Inertial Guidance and Calibration Group was inactivated on 8 November 1968 and the Aerospace Guidance and Metrology Center (AGMC) activated on the same date. A special order issued by Headquarters AFLC on 5 February 1973 designated the 2803 Air Base Group as a part of the AGMC. This Air Base Group provides all station support activities.

The Aerospace Guidance and Metrology Center is a key facility within the Air Force Logistics Command playing a vital role in maintaining the operational readiness of the Air Force's first line aircraft and missiles. The Center repairs inertial guidance and navigation systems used by virtually every aircraft and missile to assure that it arrives on target, on time, and on command. The technical repair capability assigned to AGMC represents the only complete organic capability established within the Air Force for accomplishing depot level repair of inertial navigation/guidance systems. AGMC also provides engineering support to Air Force commands and other Department

of Defense agencies on problems relating to inertial guidance and navigation, including recommendations for improving reliability and maintainability of systems and aid in the design and development of future systems. Finallv, AGMC manages the Air Force single integrated metrology and calibration program.

The inertial guidance system of a missile--or the inertial navigation system in the case of aircraft--provides the means by which the weapon is guided to its target. Composed of gyros and accelerometers mounted on stabilized platforms and controlled by computers, they are immune to jamming and other outside interference. Test and repair of these complex, sophisticated systems is the major workload of the Center. Among the weapon systems that rely on AGMC for this support are the Minuteman and SRAM (short range attack) missiles--backbone of the Strategic Air Command's deterrent force. Aircraft systems include the F4/FR-4 Phantom, C-5 Galaxy, A-7D/E, Navy A-7E, B-52, KC-135, C-141, F-111, FB-111, AC-130E, F-15, F-16, and Army OV1D Mohawk. AGMC also has been designated as a Technology Repair Center (TRC) for five models of displacement gyros. This particular type of gyro is a component of an aircraft's integrated flight director system and functions as a master flight reference control which furnishes a directional reference in azimuth and a vertical reference in pitch and roll. Aircraft supported by this work include the C-5, F-111, A-10, F-15, T-38, F-4, F-5, AC-130, T-39, B-52, C-141, F-105, F-106, AC-119, and E-3A. The Center, through an interservice agreement with the Navy, repairs and tests the Dual Miniature Inertial Navigation System (DMINS) used in the Navy's Class 688 Attack Submarine. Future AGMC workloads include the new Peacekeeper ICBM and the B-1B strategic bomber.

While maintenance of these systems occupies a majority of AGMC's 2,600 civilian and military personnel, scores of engineers, physicists, mathematicians and technicians act as the Air Force's experts on inertial guidance and navigation. They pinpoint problem areas, recommend design changes to improve reliability and maintainability, and serve as consultants

for the design and development of new systems. Provided by the Directorate of Inertial Engineering, this engineering support is designed to improve the reliability of inertial guidance and navigation systems repaired at AGMC while reducing their repair costs. This engineering support is provided in four distinct categories as follows: (1) engineering decisions are made on the spot to properly diagnose faults and recommend corrective actions, (2) engineering support is provided to the Directorate of Maintenance at AGMC and the Item Manager/System Manager (IM/SM) by evaluating procedures and equipment to improve the failure diagnostic capabilities and make recommendations for changes to repair processes and equipment, (3) engineering support is provided to the System Program Office, Item Manager and System Manager personnel on the development and acquisition of new inertial systems so that consideration will be given to life cycle costs based upon AGMC experiences on similar systems, and (4) a full range of inertial engineering support is provided to other services when the workload is assigned to AGMC under an interservice support agreement.

Metrology is the exacting science of measurement; calibration is the process of comparing test devices against known measurement standards. Managing the Air Force's metrology and calibration program is the third vital function performed at AGMC. The measurement hierarchy includes 139 base level precision measurement equipment laboratories (PMELs), certified annually by AGMC, which provide calibration services to operational systems and equipment. The accuracies of standards used at base level are directly traceable to the Air Force Measurement Standards Laboratory at AGMC. The primary standards from this laboratory are, in turn, directly traceable to the National Bureau of Standards except for precise time standards which are traceable to the U.S. Naval Observatory. As the Air Force's direct link to the National Bureau of Standards and the U.S. Naval Observatory, the Air Force Measurement Standards Laboratory at AGMC maintains standards of dimension, time, force, pressure, volume, mass, temperature, infrared, and electronics.

The accuracies and standards maintained within the Air Force Metrology and Calibration Program affect virtually every operational system and activity within the Air Force. The program is structured to assure that weapon systems, along with associated support equipment will meet their required operational ranges and accuracies. In addition to excellent facilities, the Directorate of Metrology maintains a work force composed of highly competent technical and scientific personnel. These elements coupled with broad experience in supporting measurement requirements of operational/developmental weapon systems, calibration of inertial guidance components and other advanced requirements help to explain why the AGMC calibration capability ranks as one of the finest in the nation.

III. ENVIRONMENTAL SETTING

A. Meteorology

The area surrounding Newark Air Force Station has a continental climate characterized by large annual, diurnal, and short term ranges of temperature. Summers are typically warm and humid; the mean temperature is approximately 71°F, and an average of 21 days with temperatures above 90°F can be expected. Winters are cold and cloudy; the mean winter temperature is 30.2°F, and an average of four days per year have sub-zero temperatures. Weather changes generally occur every few days from the frequent passage of cold or warm fronts and their associated high and low pressure centers. Table III-1 is a summary of temperature, precipitation and snowfall data from the Newark AFS area.

Precipitation in the area varies from year to year, but is normally abundant and well distributed throughout the year. Autumn is generally the driest season. Mean annual precipitation is 39.38 inches. The net precipitation is about 13.5 inches per year and the maximum 24-hour period rainfall is 6.0 inches. As is typical of Ohio, much of the winter precipitation comes in the form of rain. Snowfall varies greatly from the annual average of 23.6 inches with extremes ranging from three inches to nearly 40 inches. It is expected that every third winter will have at least 30 inches of snowfall.

Heavy fog with restricted visibility is a common meteorological condition that occurs about 10 times every year, mostly during the cold months. The prevailing wind in the area is from the southeast averaging about nine miles per hour (mph). Wind speeds in the winter are slightly higher than the summer. Damaging winds of 35 to 80 mph are usually associated with thunderstorms which occur about 40 days per year, primarily from April to August. The state of Ohio averages 11 tornadoes per year. However, in Licking County, where Newark AFS is located, there have been only nine tornadoes reported since 1900. Thus, tornadoes are not common meteorological events in the Newark AFS area (Miller, 1968).

TABLE III-1. METEOROLOGICAL DATA

Month	Temperature (°F)							Precipitation Totals (Inches)					
	Means			Extremes		Mean Number of Days					Snow, Sleet		
	Daily Maximum	Daily Minimum	Monthly	Record Highest	Record Lowest	90° and Above	32° and Below	Mean	Greatest Monthly	Greatest Daily	Mean	Maximum Monthly	Greatest Daily
January	37.7	20.1	28.9	76	-21	0	26	3.24	11.24	3.43	7.0	19.0	10.0
February	40.8	21.4	31.1	72	-26	0	24	2.62	4.92	1.54	5.1	16.9	8.0
March	50.4	28.7	39.5	85	-4	0	21	3.82	9.11	3.13	3.9	17.0	10.0
April	63.1	38.0	50.5	90	12	0	9	3.89	7.29	2.16	0.2	3.0	2.0
May	74.4	48.1	61.2	95	23	0	1	3.94	6.98	2.23	0.0	0.0	0.0
June	82.4	57.2	69.8	101	35	4	0	4.75	9.71	3.30	0.0	0.0	0.0
July	85.7	60.2	72.9	106	41	8	0	3.97	7.38	2.32	0.0	0.0	0.0
August	84.8	58.7	71.7	101	38	6	0	2.96	6.00	3.31	0.0	0.0	0.0
September	78.6	51.1	64.8	103	25	3	0	2.61	6.30	2.79	0.0	0.0	0.0
October	67.4	40.4	53.9	90	14	0	6	2.40	6.97	1.96	0.0	1.0	1.0
November	51.8	30.9	41.3	81	-4	0	17	2.65	4.97	2.00	2.1	13.0	5.9
December	39.9	22.4	31.1	67	-21	0	25	2.53	5.04	1.67	5.3	15.3	10.0
Year	63.0	39.7	51.3	106	-26	21	129	39.38	11.24	3.43	23.6	19.0	10.0

Period of Record: 1936 - 1965.

Source: U.S. Department of Commerce, Environmental Science Services Administration, 1968.

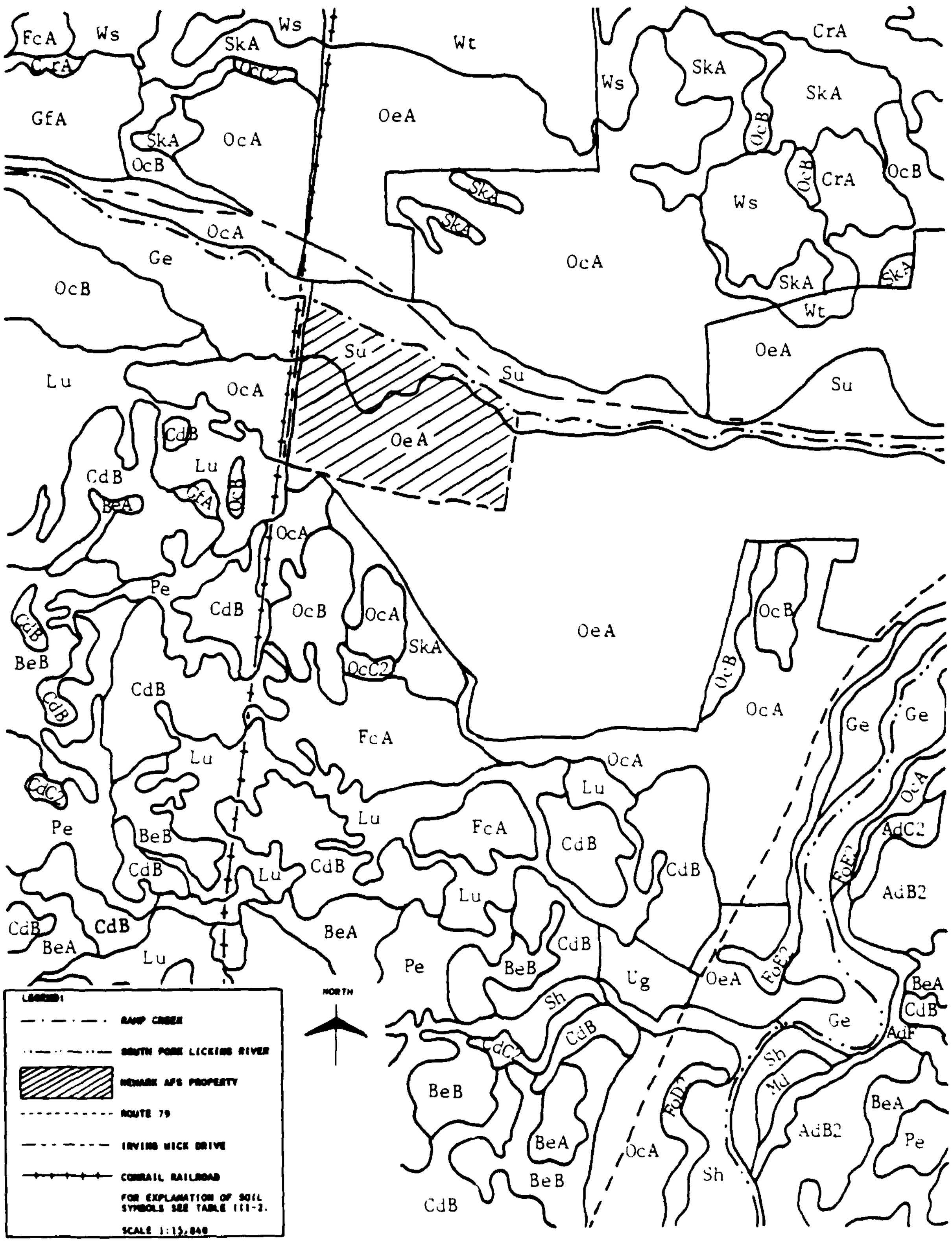
B. Geology and Soils

1. Soils

Recent soil mapping of Licking County by the Soil Conservation Service has resulted in a soil map of Newark AFS and the surrounding area. A portion of this map is reproduced and presented in Figure III-1. Table III-2 provides the legend for the map.

The soil survey identified two main types of soils that are present on the station: Ockley-Urban land complex (OeA), and Stonelick-Urban land complex soil (Su). More detailed indexing and mapping of the soils on Newark AFS was not feasible because much of the land on and around the station has been radically altered by cutting, filling, and supplementing with topsoil, or is presently covered by buildings and pavements. Thus, the mix between Ockley soil, urban land, and other soils is too complex to separate in mapping. The Stonelick soil boundary, however, extending along the north end of the station, is better defined because of less disturbance along the creek and information about the creek bed locations from photographs taken prior to area development (Parkinson, 1984).

Ockley-Urban land complex (OeA) soil consists of deep, nearly level, well-drained Ockley soil and areas of urban land on stream terraces. Soil slope is predominantly less than one percent. Most areas having this type of soil contain about 45 percent Ockley silt loam and 30-35 percent urban land. The remaining portion may be composed of mixtures of other types of soils. Typically, the Ockley soil has a surface layer of brown, very friable silt loam about 10 inches thick. The subsoil is about 46 inches thick. The upper part consists of yellowish brown, friable silt loam and firm silty clay loam and clay loam; the lower part includes brown, firm clay loam, dark yellowish brown, friable sandy clay loam, and brown, friable gravelly clay loam. The subsoil overlies brown, calcareous, loose, very gravelly sand to a depth of about 80 inches.



SOURCE: PARKINSON, USDA SOIL CONSERVATION SERVICE, AUG. 1984.

Figure III-1. Soil Map of Newark AFS and Surroundings

TABLE III-2. SOIL IDENTIFICATION LEGEND

Symbol	Field Name
AdB2	Amanda silt loam, 2 to 6 percent slopes, eroded
AdC2	Amanda silt loam, 6 to 12 percent slopes, eroded
AdF	Amanda silt loam, 25 to 50 percent slopes
BeA	Bennington silt loam, 0 to 2 percent slopes
BeB	Bennington silt loam, 2 to 5 percent slopes
CeB (CdB)	Centerburg silt loam, 2 to 6 percent slopes
CeC2 (CdC2)	Centerburg silt loam, 6 to 12 percent slopes, eroded
CrA	Crane silt loam, 0 to 2 percent slopes
FcA	Fitchville silt loam, 0 to 2 percent slopes
FoD2	Fox gravelly loam, 12 to 18 percent slopes, eroded
FoE2	Fox gravelly loam, 18 to 25 percent slopes, eroded
GfA	Glenford silt loam, 0 to 2 percent slopes
Lu	Luray silty clay loam
Md	Medway silt loam, occasionally flooded
OcA	Ockley silt loam, 0 to 2 percent slopes
OcB	Ockley silt loam, 2 to 6 percent slopes
OcC2	Ockley silt loam, 6 to 12 percent slopes, eroded
OeA (OeB)	Ockley-Urban land complex, 0 to 3 percent slopes
Pe	Pewamo silty clay loam
Sh	Shoals silt loam, occasionally flooded
SkA	Sleeth silt loam, 0 to 2 percent slopes
St (Ge)	Stonelick loam, occasionally flooded
Su	Stonelick-Urban land complex, occasionally flooded
Ug	Udorthents, calcareous
Ws	Westland silty clay loam
Wt	Westland-Urban land complex

Source: USDA Soil Conservation Service, October 1983.

Permeability of the Ockley soil is moderate in the subsoil (4.2×10^{-4} to 1.4×10^{-3} cm/sec) and rapid in the substratum ($> 1.4 \times 10^{-2}$ cm/sec). It has a moderate organic content, high available water capacity, and average natural fertility.

Stonelick-Urban land complex (Su) soil consists of a deep, nearly level, well drained Stonelick soil and urban land generally situated on flood plains. Flooding may occur at any time of the year, but usually occurs during the fall, winter, or spring. Areas of this soil class usually contain about 40 percent Stonelick soils and 35 percent urban land. Fill and flood protection levees comprise the remainder of the classification.

Typically, the Stonelick soil has a surface layer of brown, friable loam about nine inches thick. The substratum is stratified and, to a depth of about 60 inches consists of layers of brown, friable loam, dark yellowish brown, friable fine sandy loam and stratified, very friable silt loam; and fine sandy loam and loose loamy sand.

The Stonelick unit has moderate permeability in the subsoil (4.2×10^{-4} to 1.4×10^{-3} cm/sec) with moderately rapid permeability in the underlying substratum (1.4×10^{-3} to 4.2×10^{-3} cm/sec). Organic content is moderate, water holding capacity is moderate to low, and natural fertility is medium. Unlike the Ockley soils, Stonelick soils are generally not suited for construction or recreational development because of the hazard of flooding (Parkinson, 1983).

2. Geography and Topography

Newark AFS is located in the city of Heath, a few miles southwest of Newark, the county seat for Licking County. Newark is located near the center of Licking County in central Ohio. The state capital, Columbus, is 35 miles west of Newark.

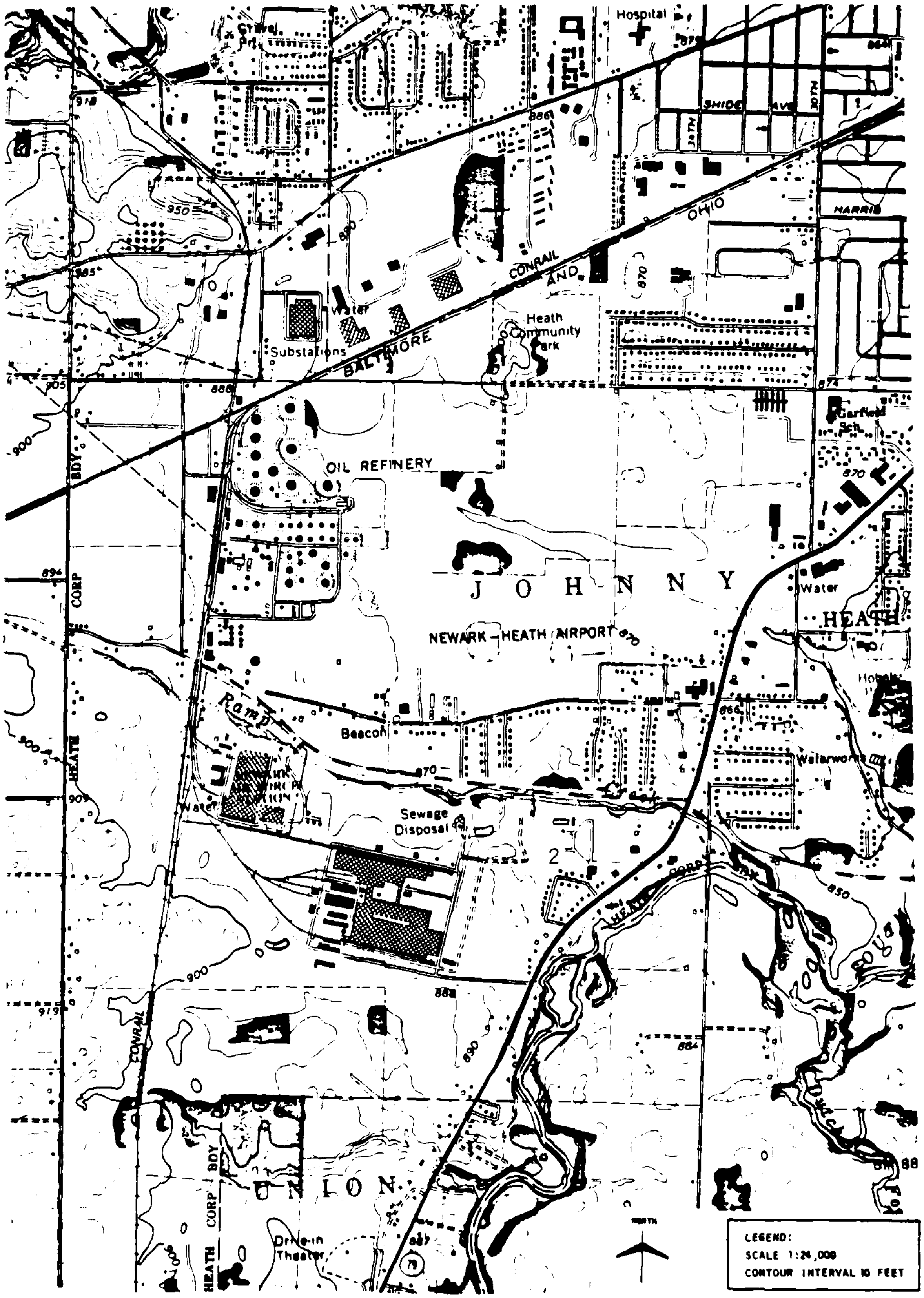
Licking County occupies part of two physiographic provinces: the eastern part is in the Kanawha section of the Appalachian Plateaus province, and the western part is in the Till Plains section of the Central Lowland province. In Licking County the approximate demarcation between these provinces is a north-south line passing about four miles west of Newark (Dove, 1960).

The average elevation in Licking County is about 1,000 feet above mean sea level (MSL). The topography of the county includes steep-sided valleys and ridges in the east rising 200 to 300 feet from the valley floors. In the western part of the county, the topography is generally flat. This is especially true of the area around Newark AFS as may be seen in Figure III-2. The city of Newark averages 835 feet MSL. The elevation at Newark AFS is about 880 feet MSL, with a maximum local relief of ten feet. Most of the 56 acres comprising the station are covered by buildings, parking lots, or roadways. The 17 acres that are landscaped generally have slopes of less than one percent.

3. Drainage

The principal river in Licking County is the Licking River. It is formed by the junction at Newark of North Fork Licking River, South Fork Licking River, and Raccoon Creek. The Licking River and its tributaries drain an area of 780 square miles and flow eastward at a gradient of approximately 3.3 feet per mile. On the northern boundary of Newark AFS, Ramp Creek flows one mile east and empties into South Fork Licking River. Ramp Creek runs for 8.4 miles and drains about 17 square miles. The average gradient of the creek is 28.7 feet per mile (ODNR, 1978).

The drainage direction on Newark AFS is approximately southwest to northeast. There are four storm sewer collection points which discharge into Ramp Creek. Runoff is largely from roofs and paved surfaces (NAFS, 1976).



SOURCE: USGS

Figure III-2. Topographical Map of Newark Air Force Station Area

4. Bedrock Geology

Sedimentary rocks belong to the Pennsylvanian and Mississippian systems. They are exposed extensively in Licking County, although no outcrops are present on Newark AFS. These rocks include conglomerate, sandstone, siltstone, shale, limestone, flint, coal, and clay. The generalized stratigraphy of the Pennsylvanian and Mississippian units, together with their water-bearing properties is given in Table III-3. The units are listed from youngest to oldest, corresponding to increasing depth. Figure III-3 is a bedrock map of the area surrounding Newark AFS. A general description of the Pennsylvanian and Mississippian systems follows.

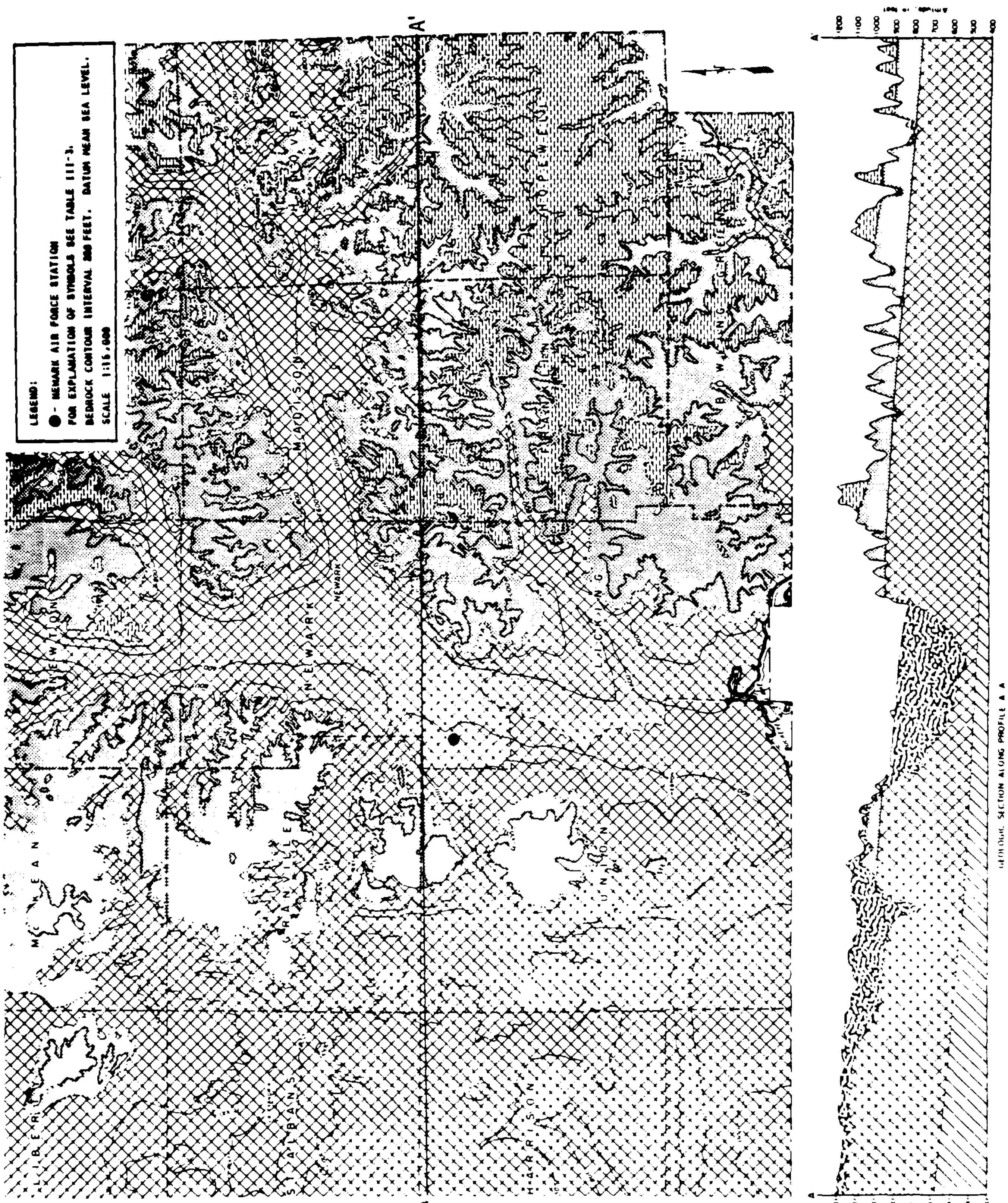
The Pennsylvanian system in Licking County is comprised of the Allegheny and Pottsville Formations. Regionally, rocks of these formations dip to the southeast at a low angle, and overlie Mississippian formations. The unconformity between the Mississippian and Pennsylvanian systems represents a major break in deposition. The sandstone, shale, coal, limestone, flint, and conglomerate deposits of the Allegheny and Pottsville Formations have maximum thickness of 225 feet in Licking County. The sandstones are typically reddish to light gray in color. Because of their superior resistance, they form the most prominent exposures of the Pennsylvanian system in the county. The coal and limestone units are thin and impure, and are usually covered by debris from the less resistant shales. The Vanport limestone member of the Allegheny Formation is the highest stratigraphic unit of the Pennsylvanian system in the county. It is typically exposed in five or six foot thick beds of flint and shaley limestone.

The basal unit of the Pottsville Formation is the Harrison member, which lies at the irregular contact of the Pennsylvanian and Mississippian systems. The Harrison member is composed of angular siliceous fragments and well-rounded quartz pebbles in iron cements.

TABLE III-3. GENERALIZED STRATIGRAPHIC SEQUENCE OF THE ROCKS IN LICKING COUNTY

System	Formation	Character of Material	Thickness (Feet)	Water-Bearing Properties
Quaternary Recent		Clay, silt and alluvium deposited on the flood plains of the principal valleys.	Not Available	Generally a poor source of groundwater owing to absence of coarse materials.
Quaternary Pleistocene	Glacial Till	Relatively thick layers of sand and gravel deposited by glacial meltwaters as surficial valley trains or buried outwash.	Not Available	Potential groundwater yields depend on thickness, permeability, and source of recharge. Where favorable conditions exist, wells may yield as much as 500, or more, gallons per minute.
		Morainal deposits as much as 330 feet thick, consisting of thick layers of clay interbedded with thin discontinuous lenses of sand and gravel.	0-330	Adequate groundwater supplies for farm and domestic requirements may be developed. Wells may be developed in underlying sandstone formations.
		Heterogeneous deposit of clay, fine sand and sand and gravel interbedded with thin lenses of sand and gravel. Deposits fill buried valley to a depth of as much as 350 feet, or more.	0-350	
Pennsylvanian	Allegheny and Pottsville	Medium to coarse-grained sandstone and shale; conglomerate; thin and impure coal and limestone, and flint.	0-225	Small supplies of water are obtained from Pennsylvanian sandstones in the eastern part of the county. The Pennsylvanian sediments are above the water table in most parts of the county and water is usually obtained from the underlying Mississippian formations.
Mississippian	Logan	Fine to coarse-grained sandstone, silty to sandy shale, and fine-grained siltstone	0-270	Generally adequate water supplies for farm and domestic requirements. Average yield to wells is about 10 gpm.
	Cuyahoga	Alternating beds of coarse-grained sandstone, siltstone, and shale	0-570	The Cuyahoga formation is the most productive of the consolidated rock aquifers in the county. Yields to wells range from 5 to more than 100 gpm.
	Sunbury Shale	Fissile, black to brown bituminous shale.	24-100	Not a source of water in Licking County. Most water supplies are obtained from the overlying deposits.
	Berea Sandstone	Fine-grained thick-bedded sandstone.	0-80	Wells generally yield ample supplies of water for domestic and farm use. Most wells in Licking County obtain water from the overlying deposits.
	Bedford Shale	Red or blue clayey shale.	20-100	Yields to wells are very small and may be completely unproductive.

Source: Ohio Water Plan Inventory, 1962 (ODNR P-14), Ohio Dept. of Natural Resources, 1960 (Bulletin 36)



SOURCE: OHIO DEPT. OF NATURAL RESOURCES, BULLETIN 36, 1960.

Figure III-3. Map of Consolidated Rocks in Part of Licking County, Ohio

Mississippian-age conglomerate, sandstone, siltstone, and shale deposits in Licking County have a cumulative thickness of 700 to 800 feet. These rocks have a regional dip of 25 to 40 feet per mile to the southeast and unconformably overlie the Ohio Shale of Middle Devonian age. The Mississippian system is divided into six main formations or groups: Maxville Limestone, Logan Formation, Cuyahoga Formation, Sunbury Shale, Berea Sandstone, and Bedford Shale. The Maxville Limestone is not present in the county, having been removed by erosion in pre-Pennsylvanian time. Thus, the Logan Formation is the youngest Mississippian age unit in the area. It is composed of conglomerate, sandstone, siltstone, and shale beds and crops out along valley walls and on hilltops. Its maximum thickness is 270 feet, but thickness varies due to surface erosion.

The Cuyahoga Formation reaches a maximum thickness of 570 feet. The predominant rock types are coarse sandstone and conglomerate overlying alternate layers of sandstone and shale. The Berea Sandstone is a fine-grained massive sandstone overlain by a black to brown bituminous shale called the Sunbury Shale. The shale averages four feet thick and the Berea Sandstone reaches 80 feet thick. Below the sandstone is a bed of shale representing the oldest formation of the Mississipian age. It is a soft, red and blue or gray shale called Bedford Shale and ranges from 20 to 100 feet thick (Dove, 1960).

5. Glacial Geology

The earliest recognizable drainage system in Ohio, referred to as the Teay drainage system, preceded the Pleistocene glacial epoch. The main branch of the system, the Teays River, ran across Ohio in a northwesterly direction southwest of Licking County. During this time the county was drained by two large rivers, one of which passed on a north-to-south course through present-day Newark. This river cut broad channels in the bedrock to depths of 300 to 400 feet below the level of the surrounding uplands. During the Pleistocene ice ages, glacial ice movement caused radical changes in the topography, and buried the valleys of the Teays drainage system under a blanket of sediments. These are of two types: till and outwash.

Till generally consists of siltstone and sandstone fragments and pebbles, small pebbles of black shale, and clay and silt. Outwash deposits consist chiefly of silt, sand, and gravel. The predominant glacial deposits in the Newark AFS area are valley-fill deposits or outwash composed of sand and gravel laid down in the valleys by flooding melt waters from the glaciers. Till is more than 300 feet thick in many areas around Newark, particularly in valley-fill deposits.

Similar types of glacial deposits cover much of the area around Newark because the low, partially filled, buried valleys were a natural drainage basin for the melting glaciers. Recent-age alluvium, including fine silts and sands, has been deposited in the basins of the present streams and rivers. These deposits are usually thin, but may vary depending on fluctuations in stream flow (Dove, 1960).

C. Ground-water Hydrology

The principal bedrock aquifer in Licking County is the Mississippian Cuyahoga Formation. It consists of interbedded sandstone and shale and is encountered at a depth ranging from 0 to 570 feet. Unconsolidated glacial deposits overlying the bedrock contain ground water and are the primary source for drinking water supplies. Subsurface water, ranging in depth from six to 35 feet may be suitable for farming or household use.

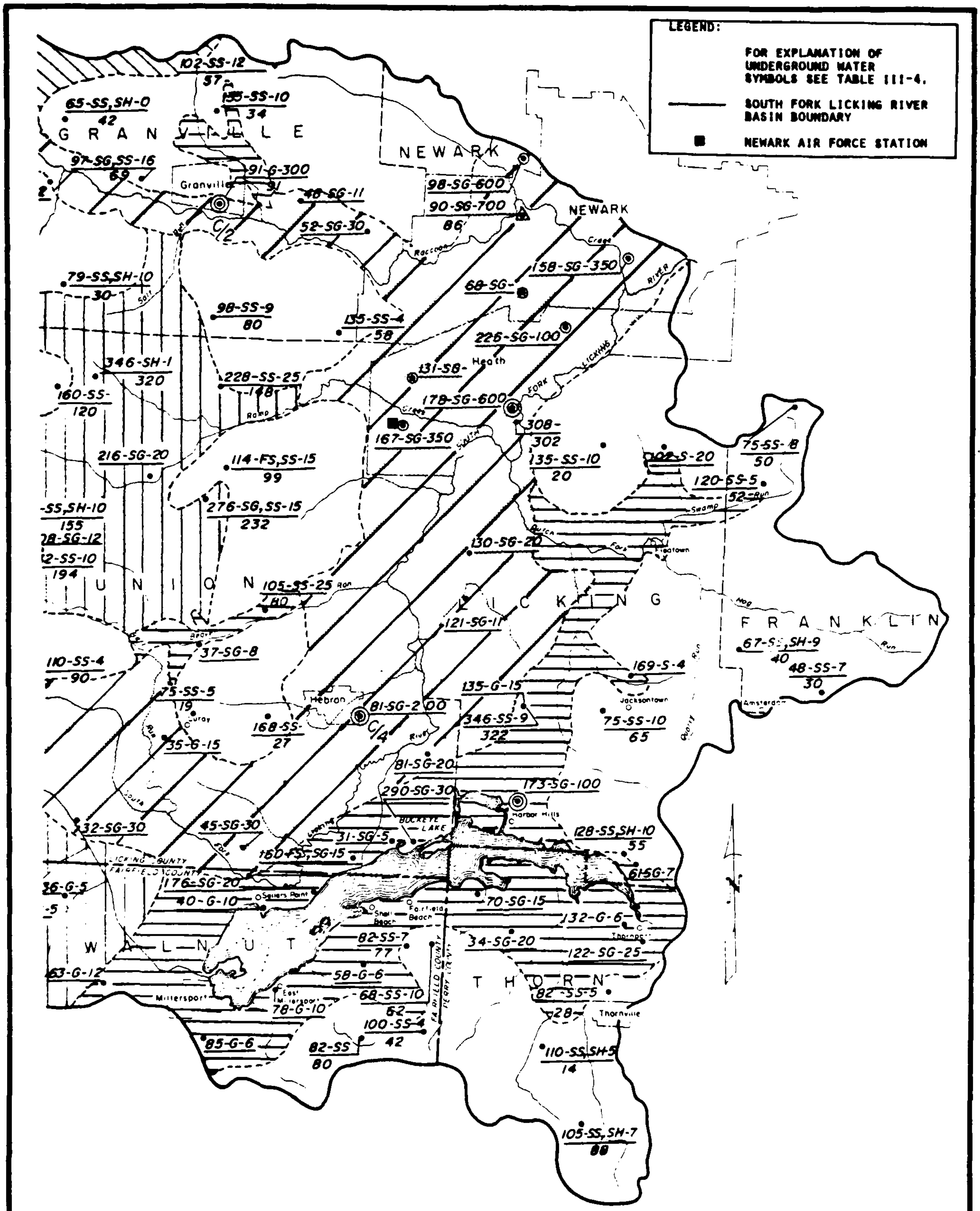
The ability of various geologic deposits to yield water depends primarily on their porosity and permeability. Sandstone formations may yield sizeable quantities of water when the sandstone is coarse-grained and not tightly cemented (i.e., has high porosity and permeability). Shale formations, which are very fine-grained and have generally low permeability across bedding, allow less movement of water and well yields are low. Unconsolidated clay and silt deposits are similar in that they store water, but their development potential is small. Sand and gravel deposits usually yield their retained water readily unless pore spaces between coarse grains are filled

with fine-grained particles. Thus, specific well yields will differ and range from less than one gallon per minute from clay or shale formations to as much as 700 gallons per minute from thick permeable sand and gravel formations (Schmidt, 1962).

Newark AFS is situated near the edge of a buried valley and overlies 250 to 350 feet of glacial deposits. Figure III-4 shows that NAFS is in an area of abundant high quality ground water resources stored in the sand and gravel deposits. Well logs from NAFS wells and several other monitor wells in the area suggest that there are two main glacial aquifers. The shallow aquifer occurs within six to 10 feet of the surface. The thickness of this aquifer varies, but it may reach 20 to 25 feet. A second deeper aquifer has a static water level about 50 feet below the surface. This aquifer may range from 60 to 100 feet in thickness, depending on the site-specific configuration of the morainal sand and gravel deposits that compose the aquifer section.

Newark AFS obtains its drinking water from three wells in the deep aquifer, drilled to depths around 150 feet. Some local residents reportedly obtain enough water for domestic use from wells drilled to less than 20 feet in the shallow aquifer. Recharge for the deep aquifer is mainly through hydraulic interconnection with streams and rivers. The shallow aquifer is recharged primarily by infiltration of precipitation. Monitoring wells operated by the state are checked periodically to quantify short- and long-term variations in water table elevation. For the present, ground-water withdrawal is not greater than recharge, and the water table in the Newark area has remained stable.

The existence of a shallow water-bearing zone on Newark AFS is documented. Depth to this zone varies with annual precipitation. The shallow unit is hydraulically connected to Ramp Creek on the north boundary of NAFS. The presence of this zone is environmentally important in that it could significantly influence the migration of potential contaminants disposed or spilled on the station. Potential for contamination of the deep drinking water



SOURCE: OHIO DEPT. OF NATURAL RESOURCES, DIV. OF WATER, P-14.

Figure III-4. Map of South Fork Licking River Basin Underground Water Availability

TABLE III-4. EXPLANATION OF SYMBOLS IN FIGURE III-4.

EXPLANATION OF SYMBOLS

•	Domestic well	*S*	Sand		
⊙	Industrial well	*G*	Gravel	*SS*	Sandstone
◎	Municipal well	*UN*	Clay, sand, gravel	*SH*	Shale
⚠	Test well	*FS*	Fine sand		

Total depth (Ft.) - Water-bearing formation - Yield (gpm)
Depth to bedrock (Ft.)

AREAS IN WHICH YIELDS OF AS MUCH AS 100 TO 500, OR MORE, GALLONS PER MINUTE CAN BE DEVELOPED

Regionally extensive permeable sand and gravel deposits may yield as much as 600, or more, gallons per minute at depths of less than 100 feet. Test drilling is recommended to locate coarser materials, owing to the presence of fine sand deposits.

AREAS IN WHICH YIELDS OF 25 TO 75 GALLONS PER MINUTE CAN BE DEVELOPED

Thin to thick lenses of sand and gravel interbedded in relatively thick layers of clay and/or fine sand. Yields depend on proper well construction although depths may exceed 225 feet.

AREAS IN WHICH YIELDS OF 5 TO 25 GALLONS PER MINUTE CAN BE DEVELOPED

Alternating layers of sandstone and shale of variable thickness beneath 14 to 110 feet of unconsolidated deposits.

Thin lenses of sand, and sand and gravel interbedded in thick layers of clayey till. These deposits are as much as 330, or more, feet thick and overlie sandstone and shale formations.

Ancient drainage systems filled with as much as 350 feet of relatively impermeable materials. Deposits consist of thin isolated lenses of sand, and sand and gravel interbedded in thick layers of clay. Yields of less than 15 gallons per minute can be expected.

Source: Ohio Dept. of Natural Resources, Div. of Water, P-14.

aquifer is low because it is overlain by a number of low-permeability fine-grained layers. However, discontinuities in these confining layers if present on the station could allow infiltration of contaminated shallow ground water to the deeper zone. Any improperly cased or abandoned wells could also provide a potential mechanism for contaminant migration.

1. Ground Water Quality

Regional quality of water from both deep and shallow wells is acceptable for industrial and domestic use with minor amounts of treatment. Generally, iron concentrations and water hardness need to be reduced to render the water potable. Water samples from 20 wells in Licking County showed a pH range of 5.4 to 7.9. Iron concentrations ranged from 0.07 to 6.1 ppm in both consolidated and unconsolidated aquifers; hardness was higher than 120 ppm from unconsolidated aquifers, and reached 610 ppm in consolidated aquifers. Dissolved solids ranged from 97 to 772 ppm, though most were below 500 ppm (Dove, 1960). Alkalinity was generally around 250 ppm as $CaCO_3$.

Water obtained from production wells tapping the deep unconsolidated aquifer on Newark AFS is treated to remove iron and reduce hardness, making it suitable for drinking and industrial use. Analyses of raw water from production wells and treated water from the distribution system are provided in Appendix G (USAF, 1984). The data reveal that most parameters were found at acceptable concentrations in the water. Metallic species which were analyzed included cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc. Generally, these are present at concentrations at or above detection limits but not at concentrations that would imperil the drinking water. Organic analyses are scarce and are generally limited to phenols and surfactants. Pesticides have been analyzed, but reports show that none have been detected. No analytical data exist on the quality of the subsurface ground water.

To the north of the installation, on the other side of Ramp Creek, the ground water has been contaminated by petroleum hydrocarbons which leaked from the old Pureoil refinery. The refinery had been in operation for approximately 50 years and had been pumping the ground water near their underground tanks in order to keep them from floating when they were empty. It is believed that over the years, hydrocarbon leakage collected in the cone of depression caused by the pumping. When the refinery shut down in 1970 and the pumping terminated, the ground water level rose to attain its original piezometric surface, causing the hydrocarbon layer to spread out. In 1971, approximately one year after the shutdown, hydrocarbon product was detected in Ramp Creek.

In 1977, a U.S. Coast Guard funded clean-up began. An oil skimmer was set up on Ramp Creek at the intersection of Highway 79 and Irving Wick Drive, approximately one mile east of Newark AFS. In addition, two monitoring wells were drilled and nine recovery wells were added along the north side of Irving Wick Drive. Approximately 400,000 gallons of hydrocarbon product were recovered and the movement of the plume was abated. Pumping of the purge wells was stopped two to three years ago when the product no longer appeared in Ramp Creek.

The location and movement of the plume is monitored on an annual basis. The largest area of contamination at the present time is located under the Licking County Airport and is not migrating. For the last three years the water table in the area has been low; however, if the water table rises due to increased precipitation, migration of the plume into Ramp Creek may again become a problem. The flow of the plume, as in the past, would be away from Newark AFS. It is believed that the installation has not been affected and will not be affected in the future by this ground-water contamination problem.

2. Local Ground Water Use

Three ground-water supply wells on Newark AFS tap a glacial aquifer about 150 feet below the station. Well yields range between 480 to 620 gallons per minute at 70 psi head pressure. These wells supply all the potable and industrial water needs of NAFS. The locations of the ground water supply wells are Buildings 6, 7, and 8. They are shown in Figure II-2.

In the community surrounding Newark AFS, private wells which tap the shallow aquifer supply water for drinking and irrigation to some residents. The city of Heath, adjacent to NAFS, obtains its municipal water from four wells tapping the deep glacial aquifer, and Newark uses the North Fork Licking River and four deep ground-water wells for its municipal water supply (ODNR, 1978). Area industries also rely on ground water to satisfy their needs. Both aquifers may be used depending on production requirements and site-specific yields.

D. Surface Water Hydrology

Newark AFS is located within the South Fork Licking River drainage area. This river drains approximately 287 square miles and is fed by numerous smaller streams and creeks including Ramp Creek on the northern boundary of Newark AFS. South Fork Licking River is a tributary of the Licking River which flows into the Muskingham River, finally discharging into the Ohio River. Surface water from these rivers provides industrial, agricultural, and domestic supplies. Ramp Creek does not serve any water supply needs in the area. However, it is used by NAFS and the surrounding community for storm-water drainage. The creek is not gauged, but only one flood has occurred in recent years. In September of 1979, a flood caused by Hurricane Fredric caused Ramp Creek to rise to the 100 year flood contours when 6.0 inches of rain fell in 17 hours at Port Columbus, Ohio. All major NAFS facilities are placed above the 100 year flood contour of Ramp Creek so the flooding hazard is low. No other surface water exists on Newark AFS or in the immediate vicinity.

E. Environmentally Sensitive Conditions

Newark AFS is situated in rolling hill country which is used for farmland and grazing except for sections of urban and industrial development. NAFS comprises 56 acres, most of which are taken up by buildings, pavements, and roads. The remainder of station land is landscaped and seeded with bluegrass, foxtail, fescue, and orchard grasses. Trees and ground cover have also been planted. This development has not endangered any wildlife, destroyed indigenous habitats, or resulted in poor land management. On the contrary, birds and small mammals such as deer, skunks, rabbits, woodchucks, and squirrels nest along the creek banks and bushy areas around the station (NAFS, 1976).

The most sensitive environmental elements on Newark AFS are the ground water and Ramp Creek. At present, these are understood to be clean and stable environments.

IV. FINDINGS

Past and current hazardous waste management practices at Newark AFS were identified and evaluated for their potential to cause environmental contamination and/or to pose a threat to human health. This section provides a summary of typical wastes and estimated quantities generated by activity, a description of past and current disposal practices used at Newark AFS, and a site-specific evaluation of all disposal sites and areas of potential contamination which were identified.

A. Newark AFS Activity Review

To identify past and present activities on the station that generate hazardous wastes, a review of current and past waste generation and disposal methods was conducted. This review included interviews with current and former station employees (both civilian and military), a search of files and records (maintained by Newark AFS and outside agencies), and site inspections.

1. Wastes Generated by Activity

Potentially hazardous wastes generated by Newark AFS can be associated with one of four groups of activities conducted on the station:

Building 4 Operations,
Fuels Management,
Hazardous Materials Storage, and
Pesticide Utilization.

The following discussion addresses those wastes generated on-station which are either hazardous or potentially hazardous wastes. A hazardous waste is defined as hazardous by the regulations implementing either the

Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). There have been no additions by the State of Ohio EPA to the current list of the U.S. EPA. Compounds such as polychlorinated biphenyls (PCBs) which are listed in the Toxic Substances Control Act (TSCA) are also considered hazardous. Other substances such as oil spills which affect the health of the environment are also considered hazardous wastes or potentially hazardous wastes. A potentially hazardous waste is one which is suspected of being hazardous, even though sufficient data may not be available to fully characterize the waste.

a. Building 4 Operations

The main industrial facility at Newark AFS is Building 4. Operations performed here include calibration and repair of inertial guidance systems and maintenance of measurement standards. These processes require the use of solvents such as freon 113 (trichlorotrifluoroethane) and 1,1,1-trichloroethane (Chlorothene-nu) for cleaning of parts.

The building, originally designed to house a heavy press stamping operation, has two large underground rooms now used for calibration processes because of their vibration-resistance. Three dewatering wells pump water from the foundation of the building, keeping the 65-foot deep pits free of water problems. Two eight-inch wells and one 30-inch well are used for this pumping. Water pumped from Building 4 flows into the storm sewer which discharges into Ramp Creek. The ground water and collected storm water runoff are discharged without a National Pollutant Discharge Elimination System (NPDES) permit. The installation had a NPDES permit prior to 1976 for the discharge of cooling tower blowdown and water treatment plant backwash. The permit was dropped when these two wastewater sources were connected to the municipal sanitary sewer.

Two major extensions were made to Building 4 after the start of the calibration and metrology work. A large warehouse extension was added to the southeast side of the building in 1976. And, an addition was made to the north end of the building in 1968 to house the Minuteman III missile operations.

Building 4 is on a concrete foundation and is totally enclosed. Any spills that occur are generally small and are entirely contained inside the building. The spills are cleaned up quickly in compliance with all provisions of the station's Resource Protection and Recovery Plan (AGMC DE Plan 1, Oct. 1979).

1) Freon Distribution and Recovery System (Clean Room Operations)

Freon 113 is used extensively in operations at Newark AFS for cleaning of parts. The quantity of freon used is estimated at 750-1,500 gallons per day. At the present time, approximately 25 percent of the freon used is virgin freon, the remainder being recovered freon. As a cost-saving measure, in 1964 a still was installed to recycle contaminated freon. This "old still" is able to process 12 gallons of freon per hour. It consists of an evaporator which is used to remove heavy components from the contaminated freon. The system is not capable of separating low-boiling components from the freon, however, resulting in recovered freon of lower purity than needed for calibration procedures. The use of freon, and hence generation of contaminated freon, exceeded the rate of recovery for the old still. In addition, the required purity of freon increased to 99.99 percent when work on the Minuteman began, making the need for an improved freon recovery system mandatory. A "new still" capable of processing 60 gallons of freon per hour became operational in 1980. Recovered freon is distributed to the various laboratories and clean rooms via an intricate "freon distribution system" of stainless steel piping. Similarly, contaminated freon is returned to the stills for recovery via a stainless steel piping network which includes small sumps located throughout the building.

Heavy components which come off the still system as column bottom product are collected in drums and are further processed or disposed of following analysis by the Physical Chemistry Lab. A wastewater stream is generated by the "new still" system which is discharged without pretreatment to the City of Heath municipal sewer system.

Two virgin freon storage tanks (Facility 83A) are located at the northeast corner of Building 4. Both tanks are above ground and are situated in an asphalt-paved area within 30 feet of the building. The older of the two tanks has a capacity of 3,000 gallons, and the newer one can hold 4,500 gallons of freon. Virgin freon is transported on-site by tanker truck. When a new load arrives the freon is circulated through the tank system for homogenization. A sample is collected and analyzed to determine if the purity is acceptable. The product is piped to the freon distribution system in Building 4 where the virgin freon is blended with recycled solvent from the new still to obtain acceptable solvent purity. No evidence of a spill or rupture of pipelines during routine operations was obtained. Therefore, past activities at this site do not pose an environmental threat.

Physical Chemistry Lab. The Physical Chemistry Lab or "Chem Lab" is central to the waste fluid disposal system in practice at Newark AFS. The lab is located in the southeast corner of Building 4. It is equipped with numerous modern analytical instruments which allow chemists and other lab workers a wide variety of capabilities. Included in the lab are atomic absorption equipment, a scanning electron microscope, a fluorometer, IR and UV spectroscopy equipment, GC/MS, GC, and much more. This equipment is used for analysis of waste samples as well as for industrial applications.

The disposition of all waste fluids is determined via chemical analyses performed in the Chem Lab. Samples are taken of every drum containing waste solvent. The composition and flash point of samples received by the Chem Lab are determined by gas chromatography and other methods, where applicable. One of six designations is then given to the waste sample, which in turn determines reuse applications of various solvents.

In addition to sample analysis, the Chem Lab operates several small-scale distillation processes for recovery of contaminated fluids used in various calibration processes at Newark AFS. The impetus behind the development of these recovery processes is the extremely high price of rare chemicals.

Air Pollution Aspects. Approximately 35 percent of the freon used in Building 4 is lost through evaporation. Pollution control devices include fume hoods and charcoal filters. Some of these discharge exhaust air inside Building 4 and the remainder are vented outside the building. Freon emissions within the building have been monitored and concentrations have not exceeded acceptable levels.

Charcoal canister filters are used on some of the exhaust systems. Air is pulled from the labs and filtered through the charcoal. The canisters are approximately four feet high and one foot in diameter. Filtered air is exhausted inside the building through the screened sides of the canisters. The canisters need to be regenerated from once a week to once in several months, depending on the freon usage. The charcoal canisters are sent to Columbus for regeneration.

2) Miscellaneous Operations

A number of miscellaneous industrial operations presently generate wastes or have generated wastes in the past at Newark AFS. All of these have been inside Building 4. Operations which use large amounts of freon are connected to the freon distribution system discussed above. Other operations are supplied with 55-gallon waste solvent drums which are located in the hallways outside work areas. These drums are analyzed by the Chem Lab when full and are subsequently disposed of or sent through one of the recovery systems. There are 12 to 13 waste solvent drum locations in Building 4. Operations employing small volumes of hazardous or flammable liquids collect their wastes in one or five-gallon safety cans. These cans are taken to the staging area

in Building 90 where they are dumped into 55-gallon drums. Once these drums are full, they are analyzed by the Chem Lab and then disposed of or sent through one of the recovery systems.

Beryllium Operations. Beryllium operations at Newark AFS include grinding of Guidance Control Assembly (GCA) Spacers on Minuteman Guidance Systems. This is a dry grinding process and is completely enclosed. Because of the small size of many gyro parts, grinding is performed under microscopes in exhaust booths. Work stations in the beryllium room are serviced by a baghouse scrubber which continuously filters the air to avoid contamination by beryllium dust.

The dust collector is located on the east side of Building 4 to the south of Building 19. The beryllium operations have been conducted at the installation since it began and the beryllium dust has always been handled in the same manner. The dust is collected in cylindrical metal containers which are reportedly changed approximately once per year. It was reported that only a small amount of beryllium dust (approximately one to two pounds) is actually collected along with the non-hazardous dust. When removed from the dust collector, the containers are filled with cement to encapsulate the dust and are sealed with a metal plate. The containers are then sent to an off-station hazardous waste landfill. At the time of the on-site survey, there were four sealed containers for disposal being stored near the dust collector.

DMSO-HNO_3 Operations. Dimethyl sulfoxide (DMSO) and nitric acid (HNO_3) are used to remove epoxy from gyro in-valves. The parts are soaked in a mixture of hot DMSO and nitric acid. Used chemicals are collected in five-gallon plastic carboys and are stored in Facility 85 for disposal through DPDO. The exhaust gases from this operation are cleaned by a scrubber installed in 1967. Fresh DMSO is stored in one-gallon jugs in a vault in the

warehouse section of Building 4. Fresh nitric acid is stored in one-gallon glass bottles in the acids section of Building 52.

Naphtha Operations. A naphtha system used to clean memory disks in the Minuteman production area was in operation from 1962 to about 1975. Naphtha for this operation was stored in underground tanks located along the east side of Building 4 to the southwest of Well #3 (Building 6). When this cleaning operation was terminated, naphtha was removed from the tanks, disposed of by contract removal, and the tanks were filled with sand. No record or reports of naphtha leaks or spills was discovered.

Titan Battery Operations. A Titan battery shop was in operation from 1963 to about 1976. This shop was located in the northwest end of Building 4. The Titan batteries were lead wet-cell batteries which needed to be recharged with electrolyte fluid. The recharging was performed in the Cut and Weld shop. Spent battery acid was put in containers, labelled, and disposed. Reportedly, the spent acid was dumped on the ground and diluted with water (Site SP-1 discussed in Section IV B).

Cut and Weld Operations. The Cut and Weld shop is now known as the "System Preparation Area" and is located in the northwest end of Building 4. The name "cut and weld" came from the process in practice from 1962 to 1965 in which shipment cans were cut open to remove the Minuteman system for repairs. The cans were then re-welded. Solvents were also used in this process. One to six gallons of spent solvent and spent battery acid were generated per week in the cut and weld and Titan battery recharging operations. Reportedly, these solvents were dumped on the ground and diluted with water (Site SP-1 discussed in Section IV B). The current system preparation process uses cans which are not welded; therefore, cutting and welding operations are no longer performed.

Incineration Operations. A small incinerator was located in the southeast corner of Building 4 for destruction of confidential documents. No hazardous materials were incinerated. Incineration of confidential documents is no longer practiced and the incinerator was removed in 1975.

Radioactive Operations. Two high-energy radioactive sources, Cs-137 and a plutonium-beryllium neutron source, are used to calibrate instruments in underground labs in Building 4. In addition, small sources, including a Cesium source, have been used since 1979-1980 for secondary source calibration. This work is done in a trailer east of Building 4 (Facility 88). Newark AFS receives these small sources from PMEL's. The emissions rates of these sources are then calibrated at Newark so that the sources can in turn be used for calibration by the PMEL's. The radioactive sources are periodically leak-tested and are returned to the manufacturer should a problem arise. The station is licensed by the Nuclear Regulatory Commission (NRC) for possession and handling of these radioactive sources.

In addition to the radioactive source calibration, machining of depleted uranium was performed at the station within Clean Room 9 from 1973 to 1976. The amount of material removed in this process was minute. Four containers of depleted uranium gyro wheels were packaged according to NRC procedures and sent off-site for burial.

B-52 Avionics Operations. Mercury-filled vacuum gauges, part of the B-52 avionics system, were used from before 1963 to about 1968. This requirement was eliminated and the remaining mercury, amounting to less than one pint, was shipped off-site for disposal.

Water Treatment Plant Operations. Water supply is treated in an on-site water treatment plant. The water first passes through a manganese zeolite system to remove iron. Then two-thirds of the water goes through a sodium zeolite softener and the water is re-mixed, resulting in a hardness of 90 ppm. A sidestream chlorination process results in 0.6 ppm of chlorine in

the water. The treated water goes directly into the water distribution system. Untreated water is stored in the water tower on the southwest side of the station. The iron sludge is discharged to the sanitary sewer.

Newark AFS has no wastewater treatment facilities. All sanitary sewage is pumped to a lift station and discharged to the City of Heath municipal sewer system.

b. Fuels Management

The Newark AFS fuels storage system includes a number of underground storage tanks, some above ground tanks, and pipelines located throughout the station. Table IV-1 is a summary of fuel storage capacities. A more detailed presentation of fuel storage arranged by tank capacity and fuel type appears in Appendix F.

Two below ground 90,000 gallon capacity propane storage tanks (Facility 41) are located near the southwest fenceline of the installation. These tanks can be connected to the natural gas distribution system as auxiliary gas supply in the event of a natural gas interruption. The system is periodically operated to assure that it is always ready for use.

The propane tanks are enclosed by a chain link fence, and the gate to the access road is secured when not in use. A water sprinkler system is also present at the refill site. The only potential contamination hazard associated with the propane tanks is an atmospheric release.

No information was uncovered during the site visit that indicated past or present problems with the propane system.

TABLE IV-1. SUMMARY OF ACTIVE FUEL STORAGE CAPACITIES AND FUEL USE, NEWARK AFS

Material[a]	Number of Tanks	Maximum Tank Volume (gal)	Minimum Tank Volume (gal)	Total Storage Volume (gal)[b]	Approximate Monthly Use (gal)	Approximate Annual Use (gal)
Propane (BG)	2	90,000	---	180,000	200	2,500
Fuel Oil (BG)	1	---	---	20,000	125	1,500
MOGAS (BG)	3	3,000	550	6,550	---	---
Diesel (2-BG, 1-AG)	3	3,000	275	6,275	350	4,200
Kerosene (AG)	1	---	---	275	As Required	

[a]AG - Above Ground
BG - Below Ground

[b]In actual practice, Newark AFS uses a safe-fill capacity which is a volume five to 10 percent less than the shell rated capacity, depending on fuel type.

Source: NAFS Ground Fuels Storage and Requirement Information, June, 1984.

A 20,000 gallon capacity below ground Number 2 fuel oil tank (Facility 89) is located on the east side of Building 4 immediately north of the cooling towers. The tank provides part of the emergency preparedness of the installation. In the event of a breakdown in the natural gas system in the cold season, this heating oil would be used. This supply is designed to last for seven days at -5°F if the tank is full.

Tank leakage or fuel spills involved with refilling from tanker trucks could lead to adverse environmental impacts. No such incident was disclosed or uncovered during the records search activities.

An underground storage tank is located on the south side of Building 4 less than 100 feet east of Well Number 2 (Building 8). This tank holds 3,000 gallons of diesel fuel which can provide service for an emergency generator and a diesel supply for Well #2. No reports of past leaks were discovered.

An above ground tank of diesel fuel located in Building 4 next to the Water Plant (Room 41T11B) is used to fuel an auxiliary pump to provide extra water pressure for the fire protection system. There was no reported evidence of leaks or spills.

Three MOGAS (motor gasoline) storage tanks (Facility 42) are located below ground at the automobile service station south of Building 2. One 3,000 gallon tank holds unleaded fuel, one 3,000 gallon tank holds diesel fuel, and a 550 gallon tank contains leaded fuel. The service station was established prior to 1973 as the Base Exchange gas station. Approximately eight years ago the Base Exchange released it to the motor pool. Service is provided for all Air Force vehicles and equipment on the installation.

There has been no history of leaking tanks or other types of MOGAS spills on the installation. Continued records keeping and routine maintenance on these tanks will provide early detection of trouble, thus limiting the scope of any environmental contamination.

One 3,000 gallon below ground tank (Facility 42A) formerly used to hold MOGAS is situated in the northwest section of the installation along the northern fenceline. This tank supplied Air Force vehicles prior to construction of the present service station.

There was no reported evidence of leaks or spills ascribed to the tank. Information concerning its present condition was contradictory. Some reports indicated the tank is filled with water or sand; others claimed it is empty.

A below ground MOGAS tank in the location of the present Minuteman III production area on the north side of Building 4 was used for servicing Air Force vehicles in the early years of the station. When the pump station was dismantled to make room for Minuteman III, the gasoline tank was excavated. No reports of leaks or spills were found through the records search or interview process.

A kerosene tank is located in the northwest corner of the station along the fenceline next to Building 49. The tank is above ground and holds 275 gallons. Kerosene has been used on the installation since its early years for fueling portable or space heaters used for heating work areas in the winter. Use of kerosene has decreased over the last few years.

The tank is constructed on a steel frame with footings that are placed on wood boards laid on bare ground. A small earthen dike was built around the tank enclosing an area of about 30-40 square feet to contain tank spills. No evidence or information regarding major spills or leaks was discovered.

c. Hazardous Materials Storage

Twelve hazardous materials and waste storage areas have been located on Newark AFS. These are areas of interest due to their potential for environmental contamination and were reviewed during the on-site survey.

1) Building 52

Building 52 is located at the northwest corner of Building 4, east of the motor pool garage (Building 17). The building is used to store virgin flammable solvents and acids and is divided into two separate sections. Building 52A is located on the west side and contains small containers of flammable materials which are stored on metal shelves. This side of the building is heated in the winter by a heater which is fueled with spent motor oil from the motor pool. Building 52B is located on the east side and contains bottles of various acids.

The floor on both sides of the building is concrete. Any spills in the building on the flammables storage (west) side drain to one of two collection drains. The drains go to the City of Heath sanitary sewer. Spills on the acids storage (east) side drain into collection troughs. The collection troughs are connected to an underground limestone pit located at the northeast corner of the building. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

2) Facility 84

Facility 84 is located in the southeast corner of the installation on the southeast side of the Radiac laboratory (Facility 88). The facility provides auxiliary storage for large containers of virgin flammable solvents. The facility is located on a concrete slab which drains to an unlined diked area. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

3) Facility 86

Facility 86 is located in the southeast corner of the installation to the east of Facility 84. It is used to store gas cylinders. A number of different types of gases are stored, including oxygen, acetylene, helium, nitrogen, argon, CO_2, and NO_2.

The cylinders are stored on an enclosed concrete slab. No ruptures were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

4) Facility 87

Facility 87 is located in the southeast corner of the installation to the east of Facility 86. The facility is used as the holding area for 55-gallon drums that are contracted for removal. When the Physical Chemistry Laboratory determines that the contents of a drum are nonrecoverable, the drum is transferred to Facility 87 for off-station transport and disposal.

Facility 87 is a three-sided covered building that is located on an asphalt-paved area. The paving is crowned at the open end of the facility and graded such that any spills will drain toward the closed end. The spilled material will drain off the asphalt to an unlined diked area. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

5) Facility 90

Facility 90 is located in the southeast corner of the installation to the east of Facility 87. It is used as a staging area for the transfer of

spent flammable solvents from one- and five-gallon safety cans into 55-gallon drums. The solvents are collected in safety cans in the Building 4 shops and are transferred to the staging area by the Materiel Control Department.

Facility 90 is a three-sided covered building that is located on an asphalt-paved area. The paving is crowned at the open end of the facility and graded such that any spills will drain toward the closed end. Spilled material will drain off the asphalt to an unlined diked area. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

6) Adhesive Storage Area

The adhesive storage area is located in the southeast corner of the installation to the southeast of Facility 86 and the southwest of Facility 87. The facility contains a small freezer unit that is used to store a special adhesive compound that must be maintained at a low temperature for extended storage. The special adhesive is not used in current operations, but may be required again in the future. The compound is being stored because it is no longer commercially available. The adhesive is contained in five gallon plastic pails (two or three at the time of the on-site survey) inside the freezer unit.

The freezer unit is set on an enclosed concrete slab. Drainage from the slab is to an unlined, undiked area. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

7) Building 17

Building 17 is the motor pool parking garage and is located to the northwest of Building 4, east of Building 52. At the time of the site visit the area was used for drum storage. Approximately 200 55-gallon drums containing dirty freon which were returned from the Defense Construction Supply

Center (DCSC) in Columbus were temporarily stored in Building 17. The dirty freon is being charged into the freon recovery system at a rate of approximately 20 drums per week. It is projected that at that rate the drums in the motor poool will all be removed by January 1985.

The motor pool cement floor is graded so that any spills drain to the north end of the building, toward Ramp Creek. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

8) Facility 95

Facility 95 is located on the southeast side of Building 4. It is an open top, fenced-in, locked area in which approximately 50 55-gallon drums labelled "used oil" were stored during the on-site survey. Reportedly the drums were empty and were removed after the on-site visit.

The drums were stored on an undiked asphalt-paved area which drains toward a storm drain. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

9) Spent Oil Storage Area

A spent oil storage area has been located on the southeast side of Building 4 to the east side of Facility 95. The area has been used to store 30-gallon drums of used motor oil collected at the motor pool (Building 17). At the time of the on-site survey there were 24 drums stored in the area. The spent oil is used to heat the flammables storage side of Building 52, discussed previously.

The drums have been stored on an asphalt paved area which would allow spills to drain to a storm drain. Since the on-site visit a waste oil collection tank near the heater outside of Building 52 has been installed. The used oil is placed into it directly from the motor pool. The spent oil storage site has been inactivated. No spills in the spent oil storage area were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

10) Facility 85

Facility 85 is located on the southeast side of Building 4. The facility is used as a holding area for hazardous materials that are contracted for removal by DPDO. At the time of the on-site survey three types of materials were being stored: beryllium parts which could no longer be used were stored in an enclosed metal cabinet; a mercury contaminated shipping crate wrapped in plastic was being stored on the asphalt; and five-gallon plastic containers of spent dimethyl sulfoxide-nitric acid ($DMSO-HNO_3$) mixture were stored in a three-sided, covered metal cabinet which was set in a diked area.

The storage containers in Facility 85 are on an asphalt-paved area. The $DMSO-HNO_3$ mixture is the only liquid material stored in Facility 85 and is in a diked area. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

11) Lot Area Drum Storage

The lot area on the southeast side of Building 4, south of Facilities 95 and 85, is used for storage of 55-gallon drums. At the time of the on-site survey, approximately 300 drums, some of which were empty and some of which were full were being stored. The contents of each of the drums has

been or will be analyzed by the Physical Chemistry Laboratory. Results of tests performed to date indicate only trace amounts of Freon present. The drum contents are believed to be rainwater that has collected in the drums.

The drums are on an asphalt paved area which would allow spills to flow to a storm drain. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

12) Building 9

Building 9 is located on the southwest side of Building 4 to the west of the Fire Station (Building 56). The building is used for storage of paint and paint supplies by Civil Engineering. The building typically contains 300-500 gallons of new paint in quart, gallon, and five-gallon containers and one to two 55-gallon drums of paint thinner. Spent paint thinner is placed into drums for contract disposal off-station.

The building has a concrete floor and a concrete foundation. There are no drains inside the building but the door opening is at floor level. There is an expansion joint between the floor and walls and the building is heated with electric heat. The building is situated in a low grade spot in the area so spills that exit the building will not drain away but tend to pond. No spills were reported and no evidence of environmental contamination was uncovered during the data review or in interviews.

d. Pesticide Utilization

Newark AFS has had a pest and weed control program since the station opened. Pesticide and herbicide use is managed by a certified entomologist in the Pavements and Grounds Shop. The program involves routine and specific job

order chemical application and spraying. Baiting is also performed for larger pests. Bait boxes are used to contain the chemicals. Pesticides and herbicides are stored on station in Buildings 49 and 20.

Pesticides are used primarily for controlling cockroaches, ants, spiders, and rats. Herbicides are used to control weed and grass growth around landscaped areas and property fence lines. Prior to obtaining "weed-eater" machines, herbicides were used to control growth in areas difficult to mow.

Pesticides and herbicides are prepared in Building 20. One to three gallon batches are mixed whenever needed. In the past, it was general practice to apply all the chemical mixed for a specific project until none remained. When Building 20 was constructed a 15-gallon tank was connected to one of the industrial type sinks. Any leftover chemical is dumped into the tank. The tank contents, if any, are then used on subsequent occasions. Interviews with station personnel revealed no knowledge of pesticide or herbicide spills or land disposal of off-spec or outdated chemicals on NAFS property. Station personnel handling pesticides and herbicides appeared knowledgeable of safety precautions and proper use of the chemicals.

2. Description of Waste Disposal Methods

Newark AFS has utilized several disposal techniques for hazardous and non-hazardous wastes throughout its 22 year history. Methods of disposal changed as awareness of environmental issues and knowledge of hazardous materials and their effects increased. A brief description of waste disposal methods follows; detailed analysis of any specific sites mentioned is provided in Part B of Section IV.

Supply documentation was used to determine which shops handle and which shops generate hazardous waste. Summary information is provided in Appendix E. For shops identified as generating hazardous waste, information on the quantities and types of disposal methods was obtained. This information is summarized in Table IV-2.

Table IV-2. INDUSTRIAL OPERATIONS (SHOPS), ASSOCIATED WASTES AND DISPOSAL METHODS, NEWARK AFS

Shop Name	Waste Current Location	Management Waste Material	Management Current Waste Quantity	Methods of T, S, D	
Aircraft Product Div (MAB)	4	Mixed Halogenated & Non-Halogenated Solvents	*	OBCR DPDO	1961-1980 1980-
		DMSO & Nitric Acid	330 gal/yr	OBCR DPDO	1961-1984 1980-
Missile Product Div (MAK)	4	Mixed Halogenated & Non-Halogenated Solvents	*	OBCR DPDO	1961-1980 1980-
Support Equipment Div (MAN)	4	Mixed Halogenated & Non-Halogenated Solvents	*	OBCR DPDO	1961-1980 1980-
Quality Assurance Div (MAQ)	4	Used Acid Solutions	20 gal/yr	OBCR DPDO	1961-1980 1980-
Metrology Support Office (MLM)	4	Stoddard Solvent	20 gal/yr	OBCR DPDO	1961-1980 1980-
Engineering Support Div (SNS)	4	Mixed Halogenated & Non-Halogenated Solvents	5 gal/mo	OBCR DPDO	1961-1980 1980-
Protective Coating Unit (DEMMC)	4	Paint Waste	100 gal/yr	OBCR DPDO	1961-1980 1980-

*Aggregate Total 5600 gal/year
OBCR - Off-Base Contract Removal
DPDO-Defense Property Disposal Office

Wastes generated at Newark AFS may be divided into three categories: sanitary, office, and industrial. Sanitary and office wastes are comparable to general municipal refuse. Industrial wastes include construction debris consisting of wood, concrete, asphalt, electrical and steel wire and other materials, fuels and oils, cleaning solvents, paints and thinners, beryllium parts or dust, radioactive materials, and pesticides and herbicides. Each of these materials has had its own history of disposal methods, though there was no evidence that any hazardous material had been buried on Newark AFS property.

In the early years of the station, trash was contract hauled by a local garbage disposal company to a local landfill. There was no discrimination between types of wastes and everything, including drums of used solvents or flammmables, was disposed of by the contractor. Later in the 1960's, the garbage contractor refused to handle any hazardous materials. Between 1962 and 1964 construction debris was landfilled in a natural hollow or ditch in the area of present Parking Lot 6. Some of the materials dumped there were also burned occasionally for fire training, but no evidence of hazardous waste burial was discovered. Sanitary sewage from the station was treated on-site in a package treatment plant until November 1964. At that time, connection was made to the City of Heath sanitary sewage system.

Cleaning solvents have always been part of NAFS' industrial operations. In approximately 1964, a recovery still was constructed to recycle a portion of the freon used since freon was the solvent used in the largest volumes. In 1980, a second still was put into operation, further increasing the recycle capabilities of the station. This prevented much of the contaminated freon from having to be disposed. Still bottoms and other mixtures of solvents used on station are collected in drums. The staging or collection area for the hazardous liquids is in Facility 90. Safety cans of one or five gallon capacity are used to transport the wastes from the areas of use (mainly in Building 4) to the staging area. Once a drum is filled, a sample is analyzed by the Chem Lab to determine if the contents may be recycled or if they need to be disposed. Disposal for liquid and solid hazardous wastes, including beryllium dust which is set in concrete, is done through DPDO which handles contract disposal of the generated hazardous wastes.

Some other hazardous or potentially hazardous materials are recycled or reused on the station. Pesticides and herbicides are mixed in small quantities and any leftover material is used for subsequent treatment. Used motor oil and pump lubricating oil is collected in barrels and used to fuel an oil burning furnace that heats the chemical storage facility (Facility 52) during the cold season. Small quantities of PCB contaminated oils are removed from electrical equipment. These oils are not burned but are disposed of through DPDO.

B. Disposal Site Identification, Evaluation, and Hazard Assessment

As a result of Phase I activities at Newark AFS, five sites/areas of potential environmental concern were identified. Additionally, two subsites were identified within one larger site.

In the following sections, each of the sites and subsites is described in greater detail. Based on the information available, a determination of the potential for hazardous chemical migration from each site and subsite was made. Those sites and subsites determined to pose a potential threat to human health and the environment via migration of hazardous constituents resulting from past operations were analyzed using the Hazard Assessment Rating Methodology (HARM). The Decision Tree logic used to determine whether each site and subsite should proceed to the HARM rating step is outlined in Table IV-3.

Screening of the original five sites and two subsites resulted in two sites and two subsites progressing to the HARM model ranking step. These sites, along with their HARM scores, are summarized in Table V-1 (Conclusions). The locations of the five sites and two subsites of potential environmental contamination at Newark AFS are shown in Figure IV-1 and are described briefly in Table IV-4.

TABLE IV-3. SUMMARY OF DECISION TREE LOGIC FOR ALL SITES IDENTIFIED IN THE NEWARK PHASE I STUDY

Site Number	Description	Potential for Contamination by Hazardous or Toxic Materials	Potential for Contaminant Migration	Potential for Other Environmental Concerns	Refer to Station Environmental Program	Rate Using HARM
FR-1	Fire training area	No	No	No	No	No
LF-1	Dumping ditch in area that is currently Parking Lot 6	No	No	No	No	No
AT-1	Acid storage tank	Yes	Yes	Yes	Yes	Yes
SP-1	Spill site near northeast corner of Building 4	Yes	Yes	No	No	Yes
SP-2	Spill site along entire perimeter fence	Yes	Yes	No	No	No
SP-2A*	Spill site near southeast corner of Building 4	Yes	Yes	No	No	Yes
SP-2B*	Spill site on visitors and contractors parking area	Yes	Yes	No	No	Yes

*Subsites along perimeter fence where major spills occurred.

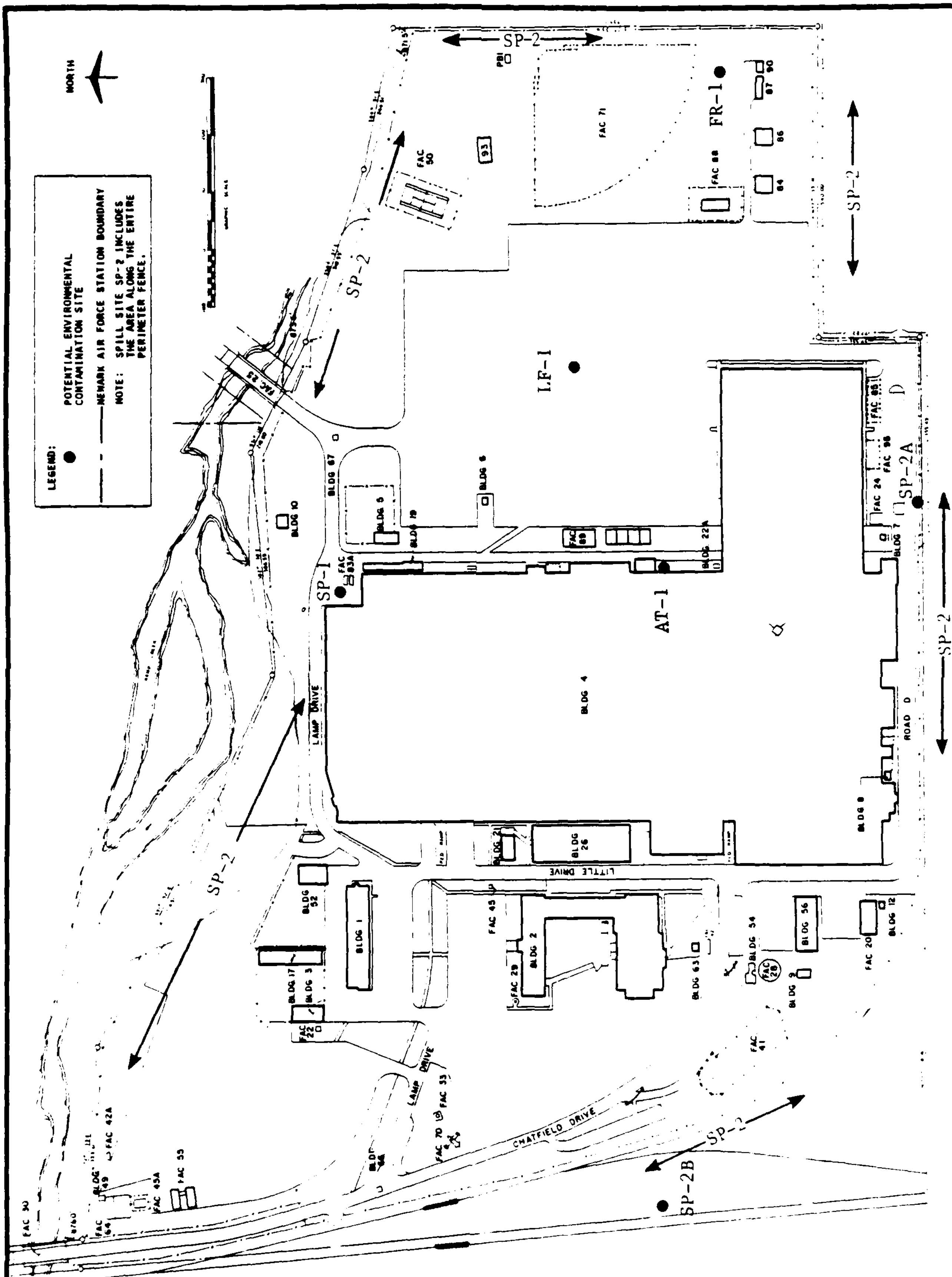


Figure IV-1. Locations of Identified Sites of Potential Environmental Contamination, Newark AFS, Ohio

TABLE IV-4. IDENTIFIED SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION AT NEWARK AFS, OHIO

Site Number	Description	Site Status*
FR-1	Fire training area (FR) located in the southeast corner of the installation between Facility 90 and the softball field fence.	I
LF-1	Landfill ditch (LF) located on the east side of Building 4 in the area that is currently Parking Lot 6.	I
AT-1	Acid storage tank (AT) located near the cooling towers on the east side of Building 4 that is piped to the freon recovery system in Building 4.	A
SP-1	Spill site (SP) located near the northeast corner of Building 4 in the area presently occupied by the virgin freon storage tanks.	I
SP-2	Spill site along entire perimeter fence.	I
SP-2A†	Spill site located on the fence line on the southeast side of Building 4 to the southeast of Well Number 1 (Building 7).	I
SP-2B†	Spill site located on the west side of the installation near the visitors and contractors parking area.	I

*I - Inactive site, A - Active site

†Subsite along perimeter fence where major spill occurred.

1. Site FR-1 Inactive Fire Training Area

A small fire training pit (approximately four foot square) was located in the southeast corner of the installation between Facility 90 and the softball field fence. The site was active from 1981-1983, when it was closed and covered with soil and grass. Lumber and paper were the only materials burned in the pit. The fires were started using paint rags and were extinguished using water, CO_2 and some types of foam from hand-held fire extinguishers. Reportedly, no hazardous materials or fuels were burned in the pit. Prior to 1981 and after 1983, fire training activities occurred off-station, except for some occasional activities reported to have occurred in the early 1960s.

No evidence of environmental contamination was uncovered during the data review or in interviews. Since no hazardous materials were burned in the pit there is no potential for contaminant migration and no potential health hazard. Therefore, site FR-1 was not rated using HARM.

2. Site LF-1 Landfill and Construction Debris Area

Information obtained through interviews of station personnel indicate that a ditch or natural hollow located near the eastern edge of what is presently Parking Lot 6 was used for dumping of waste materials from 1963 to 1965. It was used mostly for disposal of construction debris such as electrical wire, cable, piping, concrete rubble, and wood. Unverified information indicates that paint cans (one and five-gallon sizes) were also occasionally disposed. In the early 1960s, fire training exercises were staged in this location periodically, but materials burned were restricted to wood and other construction materials. No known chemicals or hazardous wastes were dumped or burned on this site. Domestic wastes generated on the installation have always been disposed off-site by a trash contractor and were never land-filled

at this site. In 1965 when the dumping was terminated, the site was covered with dirt and graded. When the parking lot was paved in 1975 the area was totally excavated and the debris removed.

This site was not considered to have potential for environmental contamination. If paint cans were ever dumped, they would only constitute a minor waste quantity, of which the potentially hazardous component volume would be even less. Presently, the site has been excavated and is covered by a paved parking lot. There are no potential health hazards associated with this site, therefore, the HARM model was not applied. Present and future environmental impacts are not expected.

3. Site AT-1 Acid Storage Tank

A 1,000-gallon acid storage tank is located against the wall on the east side of Building 4 near the cooling towers. This tank was built in the early 1960s to hold acids for use in water treatment. The tank is built above ground on a raised concrete base filled with limestone. A drain at the bottom of the base is valved and opens into the sanitary sewer. The tank was never used for its designed purpose and remained idle until recently.

Approximately one and one-half years ago it was converted for use as a separating tank for contaminated freon. This contaminated freon was generated by Newark AFS and retained by the Defense Construction Supply Center (DCSC) for future recovery during the years 1964-1980 when the "old still" could not keep up with the rate of freon use. The tank is filled with contaminated freon which is allowed to stratify. The recycleable fraction is drawn off and piped into Building 4 for recycling, and the process is repeated. Environmental contamination and potential for contaminant migration result from spillage on and around the tank when the 55-gallon drums are dumped into the top of the tank. Any spillage into the raised concrete base can be contained by closing the drain valve, but reportedly this drain was sometimes opened. Spillage outside the concrete base goes directly to the ground.

During the on-site visit, it was observed that some spillage had occurred outside the concrete base. This site was rated using the HARM model because of the evidence of spillage of hazardous materials, and their potential migration into the subsurface water. The HARM score for this site is 53.

4. Site SP-1 Spent Battery Acid and Spent Solvent Spill, Northeast Corner of Building 4

From 1963 until approximately 1976, Titan missile batteries were serviced in Building 4. The lead wet cell batteries had to be refilled with electrolyte fluid in order to be recharged. During on-site interviews it was learned that from 1963 until 1965 the spent battery acid was dumped on the ground near the northeast corner of Building 4 in the area that is the current location of the virgin freon storage tanks (Facility 83A). It was also learned that during the same period, solvent chemicals from the cut and weld shop in Building 4 were also dumped there. When the materials were poured on the ground they were watered down with a garden hose. The watering duration was highly variable.

Exact quantities of spilled material could not be determined. However, dumping reportedly occurred on a weekly basis with a maximum volume being approximately six gallons, but with one to two gallons being a typical amount. The exact composition of the cut and weld shop wastes is unknown; however, they were most likely flammable solvents.

Due to the shallow depth of the groundwater and the proximity to Ramp Creek, Site SP-1 was rated using the HARM model. The site received a HARM score of 58.

5. Site SP-2 Dirty Freon Spill, Entire Perimeter Fence

During on-site interviews, it was learned that significant amounts of dirty freon were dumped during the time period from 1973 until 1980. The freon was used to kill weeds along the entire perimeter fence. In addition, large quantities (up to 12 55-gallon drums) were dumped at the same time on several occasions in selected areas when no empty drums were available for use in Building 4.

It was reported in interviews with several station personnel that 15,000 to 20,000 gallons of dirty freon were dumped during this time frame. The exact quantities were disputed and some station personnel reported that only minor amounts (less than 100 gallons) were dumped. Reportedly, the open drums were transported along the fence with the freon spilling on the ground. Most of the dumping occurred during the summers and the majority occurred prior to 1977.

It is uncertain how much of the dirty freon would evaporate and how much would soak into the ground (or run-off) during large dumps. It is possible that some of the freon and less volatile components of the dirty freon mixture would penetrate the surface soil layer and enter the shallow ground-water aquifer. Unlike petroleum products, freon is heavier than water and would not float on the ground-water table. Vertical migration of freon could continue unless it encountered an impermeable clay layer. At that point, lateral migration and/or adsorption on clay particles could occur.

During interviews with station personnel two specific spill locations of large quantities of dirty freon, designated SP-2A and SP-2B were identified. These are considered as subsites of SP-2 because they represent specific locations along the perimeter fence where dumping occurred. The two subsites will be discussed in detail below.

Although the entire perimeter fence is an area of potential contamination and potential contaminant migration it was not rated using the HARM model. This is because the rating items of the HARM model apply to a specific point source or area. It would not be appropriate to rate the entire perimeter fence using the "worst case point" for each rating item. This approach would give an artificially high HARM score that would not be indicative of the true hazard of the site and would not be comparable to other HARM scores at the same installation for relative ranking purposes. It would also be inappropriate to divide the fenceline up into numerous individual sites and rate each separately because it is not possible to determine the quantity of dirty freon that was dumped along any particular section. Rating of the two subsites for which more specific information is available is a substitute for rating the entire perimeter fence. The relative potential risk assigned to the entire fenceline can be interpreted to be similar to the relative potential risk assigned to each of the subsites.

a. Subsite SP-2A Dirty Freon Spill, Southeast Side of Building 4

During on-site interviews, it was determined that a large quantity of dirty freon had been dumped along the fence on the south side of Building 4 a few feet to the east of Well Number 1 (Building 7). It was reported that approximately 5,000 gallons of dirty freon were dumped in this location from approximately 1973 until 1977.

As discussed previously, dirty freon spills have the potential for migration; therefore this subsite was rated using the HARM model. The subsite received a HARM score of 72.

b. Subsite SP-2B Dirty Freon Spill, Visitors and Contractors Parking Area

During on-site interviews, it was determined that a large quantity of dirty freon had been dumped in an area that is now the gravel-covered

visitors and contractors parking area located on the west side of the installation. It is uncertain exactly how much dirty freon was dumped in this area or the exact time frame involved. It is believed that dumping began in approximately 1973 and stopped in 1980.

As discussed previously, dirty freon spills have the potential for migration; therefore this subsite was rated using the HARM model. The subsite received a HARM score of 69.

V. CONCLUSIONS

The goal of the IRP Phase I Records Search is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on the assessment of information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with base personnel, past employees, and state and local government officials. A listing of all interviewees and outside agency contacts is provided in Appendix B.

Three sites were not rated using the HARM model. The inactive fire training area was not rated because no hazardous materials were burned in the pit and there is no potential for contamination. The landfill and construction debris area was also not rated because no hazardous materials were known to be dumped there. The third site which was not rated was the entire perimeter fence area. This site was not rated because of difficulties in applying specific rating factors (see Section IV B.5). Instead, two subsites along the fenceline were rated. More information was available for each of the subsites.

Table V-1 is a ranking of the potential contamination sites and subsites identified at Newark AFS by their final HARM scores. HARM subscores for those sites and subsites are also provided. The meteorology, geology and population characteristics for the sites and subsites are very similar, so some effort was made to emphasize the differences between them. In addition, some of the data are somewhat speculative, being primarily based on interviews and worst case scenarios.

Receptor scores for all of the sites and subsites were 47. This is due to the small area of the installation and the relative proximity of the

TABLE V-1. SUMMARY OF HARM SCORES FOR THE RATED SITES, NEWARK AFS, OHIO

Site Number	Site Description	Rank	Receptor Score	Waste Characteristic Score	ᒥ ·hway .core	Raw Score	Final Score
SP-2A*	Dirty freon spill, southeast side of Building 4	1	47	100	69	72	72
SP-2B*	Dirty freon spill, Visitors and Contractors Parking Area	2	47	100	59	69	69
SP-1	Spent battery acid and spent solvent spill, northeast corner of Building 4	3	47	60	67	58	58
AT-1	Acid storage tank	4	47	60	61	56	53

*Subsite along perimeter fence where major spill occurred.

sites and subsites. High rating factors were applied for distance to nearest well and to the reservation boundaries; however, these were offset by low rating factors applied for surface water quality and ground-water use.

Waste characteristics scores ranged from 60 to 100. Confirmed levels of large quantities contributed to the high score at the two subsites. The Sax level for methylene chloride and toluene (components of dirty freon) and the presence of chlorinated hydrocarbons (Freon 113) in the liquid state also contributed to high values at all of the sites and subsites.

No direct or indirect evidence of migration of hazardous contaminants was observed at any of the sites or subsites; therefore, the pathways scores were determined by rating the migration potential for surface water, flooding and groundwater. Pathways scores ranged from 59 to 69. The short distance from any of the sites and subsites to Ramp Creek and the high rainfall in the area contributed to the high scores. The potential for migration to surface water was the highest rated pathway for all of the sites and subsites.

The one spill site and the two spill subsites currently have no containment systems and therefore HARM scores were not reduced by accounting for waste management practices. The acid storage tank does have a small spill containment basin located beneath it and the HARM score for that site was reduced by five percent.

VI. RECOMMENDATIONS

The final HARM scores of each of the four rated sites and subsites were compared and a relative scale of potential risk was developed which is presented in Table VI-1. Of greatest concern are high risk potential subsites SP-2A and SP-2B. Recommendations for Phase II activities at these subsites are described below. Site SP-1 received a moderate potential risk rating. However, due to the uncertainty of the spill volume and the amount of time elapsed since the spill, no Phase II activities are recommended at this time. The remaining rated site, Site AT-1, is considered to have a low potential risk. On the basis of data currently available, no further actions are recommended.

A. Recommended Phase II Activities

A stepwise approach has been taken in recommending Phase II activities. This approach provides the most cost-effective means of determining whether environmental contamination from past disposal activities has occurred, and if so, the extent of the impact.

1. Stage 1 Activities

As a preliminary step to determine if contamination has occurred, it is recommended that six water samples and two soil boring samples be collected and analyzed. The recommended locations for sample collection are shown on Figure VI-1.

The ground water from the shallow aquifer that is being pumped up by the Building 4 sumps and the water from each of the three water supply wells located on NAFS should be sampled. The ground water from the Building 4 pumps should be collected as separate samples from each of the three pump locations if possible. The water wells should be sampled at their normal monitoring locations. These water sampling locations are not located at the spill

TABLE VI-1. POTENTIAL RISK RANKING BASED ON FINAL HARM SCORES

Site Number	Description	Final HARM Score	Potential Risk
SP-2A	Dirty freon spill, southeast side of Building 4	72	High
SP-2B	Dirty freon spill, Visitors and Contractors Parking Area	69	
SP-1	Spent battery acid and spent solvent spill, northeast corner of Building 4	58	Moderate
AT-1	Acid storage tank	53	Low

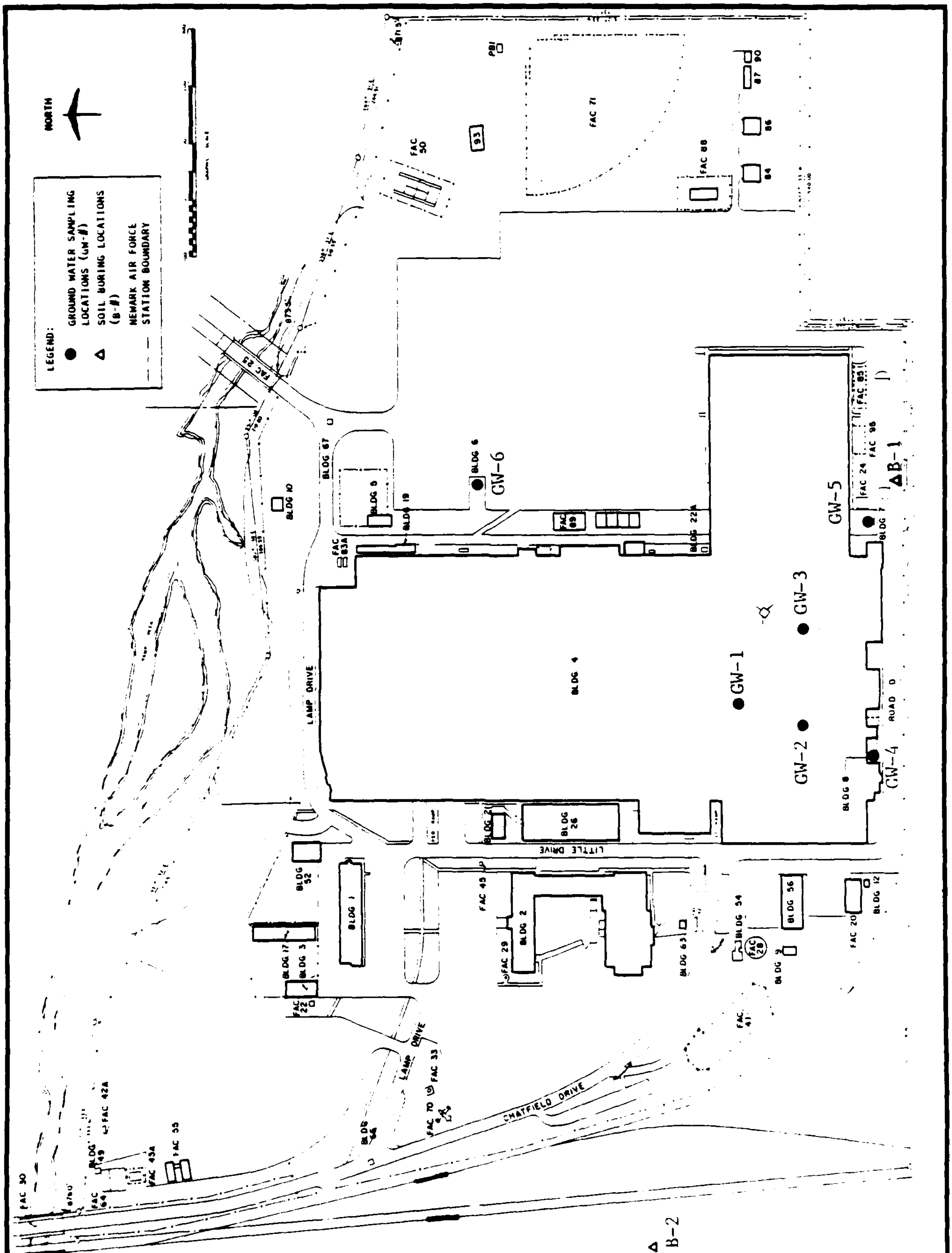


Figure VI-1. Recommended Sample Collection Locations, Newark AFS, Ohio

subsites themselves. Sampling the ground water at the actual spill subsites should not be required because of the small size of the installation (the existing wells are close to the spill subsites) and the unknown effects of the ground-water pumping on ground water flow patterns under the installation.

Soil boring samples should be collected at each of the two spill subsites that received a high potential risk rating, SP-2A and SP-2B. Since Freon 113 is heavier than water, any freon which enters the ground-water system may continue to migrate vertically until it reaches the shallowest impermeable clay layer. Therefore, the soil borings should be drilled to approximately 60 feet, with samples collected at five foot intervals.

If none of the specified pollutants are detected in any of the samples collected during Stage 1, no additional Phase II activities would be required. However, it is recommended that annual collection and analysis of a ground-water sample and analysis of well water samples for the specified pollutants become a part of routine monitoring.

2. Stage 2 Activities

If pollutants are detected, then Phase II Stage 2 activities need to be implemented. These involve additional sample collection and analysis through the use of additional soil borings and/or monitoring wells in the area where the contamination is present.

If pollutants are detected in either of the two soil boring samples, then additional soil borings should be taken in a concentric circular pattern from the subsite in order to establish the boundaries and shape of the contaminated area. If pollutants are detected in any of the water wells, then deep monitoring wells may need to be placed in a grid pattern around the wells in order to determine the extent of a plume. If pollutants are detected in the ground-water pump samples, then shallow monitoring wells may need to be placed in a grid pattern around Building 4. Each grid pattern would consist of three

monitoring wells, one upgradient of the site, and two downgradient. Full determination of the extent of contamination is to be accomplished by this recommended Stage 2 program.

B. Recommended Pollutants for Analysis

Considering the nature of the wastes that may be present, it is recommended that all of the samples be analyzed for acetone, methylene chloride, Freon 113 (trichlorotrifluoroethane), toluene, 1,1,1-trichloroethane, xylene and total organic carbon (TOC). The analysis should be done in accordance with the specifications of EPA SW-846 (U.S. EPA, 1982). Method 8240, including the purge and trap, should be performed for the volatile organics and Method 9060 should be performed for TOC. In addition, special sampling techniques may be required to collect the soil borings for analysis of volatile organic compounds.

APPENDIX A

Resumes of Key Project Personnel
for the Phase I Records Search
at Newark AFS

FRANCIS J. SMITH

EDUCATION:

M.S., Sanitary Engineering, Massachusetts Institute of Technology, 1954.

B.S., Civil Engineering, University of Michigan, 1950.

EXPERIENCE:

Program Manager, Research and Engineering Operations, Radian Corporation, McLean, Virginia, 1981-Present.

Senior Associate, Occupational Health and Safety, Environmental Engineering, A.T. Kearney Management Consultants, Alexandria, Virginia, 1980-1981.

Acting Chief Environmental Planning, Logistics and Engineering, Headquarters USAF, Washington, D.C., 1979-1980.

Chief Environmental Policy, Logistics and Engineering, Headquarters USAF, Washington, D.C., 1976-1979.

Director Environmental Protection, Air Force Systems Command (AFSC), Andrews AFB, Maryland, 1972-1976.

Chief Bioenvironmental Engineering, Headquarters Pacific Air Force, Hickam AFB, Hawaii, 1968-1972.

Similar assignments at Headquarters Alaskan Air Command, Headquarters Tactical Air Command and at Subcommands of Strategic Air Command, 1951-1968.

Junior Industrial Waste Engineer, Lederle Division, American Cyanamide, Pearl River, New York, 1950-1951.

RELEVANT EXPERIENCE:

Mr. Smith is the program manager for the Radian Basic Ordering Agreement (BOA) with the Air Force Engineering and Services Center (AFESC). It includes provision of a broad range of environmental engineering and hazardous waste management services. He is also responsible for coordinating Radian marketing to the Department of Defense. Among the areas of concern are: all aspects of the environment, occupational safety and health, hazardous wastes, analytical services and robotics.

He was the certified industrial hygienist and consultant for A.T. Kearney Management Consultants. In addition to the routine occupational safety and health activities he specialized in the interpretation of the EPA RCRA regulations. He coordinated the preparation of the proposal to EPA which brought Kearney the award of the first contract to provide RCRA technical assistance to EPA.

While at Kearney, he also participated in a health and safety evaluation of cement plants that sought to burn chemical wastes. He co-authored a feasibility study on "Assessment of Waste Fuel Use in Cement Kilns." In the same area of concern, he prepared a Draft Environmental Impact Statement (DEIS) on the burning of chemical wastes at a cement kiln. For the National Highway Safety Transportation Agency, he prepared the technical portions of a report on the testing of truck tire noise.

For three of the last four years in his assignment with Headquarters USAF, he was responsible for the air, land and water pollution abatement programs. This included programming an average of $19 million per year. Also included were: the implementation of RCRA hazardous waste management; the first USAF installation restoration program (equivalent of CERCLA-superfund); management of 17 million acres of natural resources; and the NEPA environmental impact analysis program.

In addition to these activities, he assumed responsibility for one year for the rest of Environmental Planning. This included: comprehensive base planning; the Air Installation Compatibility Use Zone (AICUZ) plans for acquiring land near bases with high noise or accident potential; and development of environmental methodologies.

At the Air Force Systems Command (AFSC), Mr. Smith organized an office to address effects of the new Federal environmental laws on the Research, Development and Acquisition programs. This office, which reported to the AFSC Chief of Staff was the highest level environmental activity ever established at a USAF major command. He directed almost all of the environmental impact statements (EIS) issued by the Air Force in this period. As part of implementation of the National Environmental Policy Act, Mr. Smith implemented a computerized system for all Research and Development projects, programs, and tasks. The program is still used. On two occasions, he was an expert witness for the Federal government. One was a suit over the health hazards associated with the siting of new type radar stations in California and Massachusetts. The other pertained to the environmental impact statement (EIS) for new facilities at Colorado Springs, Colorado.

Additionally, he was responsible for advising on the industrial hygiene and environmental needs of government owned contractor operated (GOCO) industrial plants. In this assignment and all that follow, a part of each was spent in conducting health and environment compliance inspections and audits at military installations.

During his assignment to the Pacific Air Force, Mr. Smith provided environmental and industrial hygiene guidance to USAF activities in Korea, Japan, Taiwan, Vietnam, Thailand, Philippine Islands, Guam, Trust Territories and Hawaii. This included the traditional areas of sanitary engineering (water supply, treatment and distribution; waste collection, treatment and disposal; and pest control). It also included more modern problems, such as LASER equipment calibration, maintenance and use; handling of large volumes of herbicides; noise control; industrial hygiene; and heat and cold extremes; decontamination and quarantine of equipment to prevent introduction of foreign

fauna or flora into the U.S.A. from Asia. For four years, Mr. Smith was a member of the United States delegation to the South East Asia Treaty Organization (SEATO) Military committee. He represented the U.S.A. with regard to public health engineering policies. Mr. Smith also evaluated USAF civic action programs to provide basic water and waste disposal to rural Thai villages.

The earlier USAF assignments in various commands provided environmental engineering and industrial hygiene support for the combat Air Force. Many of the previously mentioned activities were carried out as well as support for the current priority preventive medical activities. Some examples of the latter would be: defense against accidental release or delivery and use of chemical agents; improved water treatment plant operations; improved wastewater facilities and operations; conversion of dumps to sanitary fills; substitution of less toxic materials; engineering control of working exposures.

Mr. Smith worked for American Cyanamide on improving the industrial wastewater treatment of the flows from penicillin production.

CERTIFICATIONS/REGISTRATIONS AND PROFESSIONAL SOCIETIES:

Certified Industrial Hygienist by the American Board of Industrial Hygiene, 1971, No. 690.

Certified Safety Professional by the Board of Certified Safety Professionals of the Americas, 1972, No. 2103.

Registered Professional Engineer, State of Massachusetts, 1963, No. 19021.

Diplomate, American Academy of Environmental Engineers.

American Industrial Hygiene Association (National and Baltimore-Washington).

American Conference of Government Industrial Hygienists.

National (and Maryland) Society of Professional Engineers.

Federal Water Quality Association.

American Defense Preparedness Association.

Air Force Association.

MICHAEL A. ZAPKIN

EDUCATION:

M.Eng., Environmental Engineering, Rensselaer Polytechnic Institute, 1982.

M.S., Biology, Rensselaer Polytechnic Institute, 1979.

B.S., Biology, Rensselaer Polytechnic Institute, 1977.

EXPERIENCE:

Staff Environmental Engineer, Radian Corporation, McLean, Virginia, 1983-Present.

Environmental Engineer, Radian Corporation, McLean, Virginia, 1981-1983.

Research Associate, Department of Chemical Engineering and Environmental Engineering, Rensselaer Polytechnic Institute, Troy, New York, 1979-1981.

RELEVANT EXPERIENCE:

Mr. Zapkin is currently the Project Director for three USAF Record Searches which are Phase I's of the DOD Installation Restoration Program (IRP). As Project Director he is responsible for planning and coordinating all of the efforts of the Record Search Teams; schedule and budget control; and interfacing with the AFESC, MAJCOM, and installation representatives. His dual background as an environmental engineer and ecologist combined with his research on hazardous wastes from the organic chemical manufacturing industries have been of great value in this role.

Mr. Zapkin's work at Radian has primarily been in the areas of effluent guidelines development, process analysis, waste control technology analysis, and field sampling activities. Mr. Zapkin has served as Task Leader on a large multi-task contract with EPA's Effluent Guidelines Division to develop effluent limitations guidelines and standards for the nonferrous metals industry. In this capacity, he has directed efforts to propose regulations for the Nonferrous Metals Forming Point Source Category. Some of the activities under Mr. Zapkin's direction included: development of questionnaires to gather flow, production, and concentration data from industrial plants and an industry mailing list; development of an industry subcategorization scheme; engineering site visits and sampling trips at 23 industrial facilities; evaluation of end-of-pipe wastewater treatment technologies and in-process flow reduction technologies; developing compliance costs on a plant-by-plant basis; collecting, documenting, and analyzing additional technical data; preparation of a development document and rulemaking package; and numerous quick-response efforts. Prior to directing the effort for nonferrous metals forming, Mr. Zapkin served as Task Leader for the development of proposed regulations for the Aluminum Forming Point Source Category.

Mr. Zapkin has participated in a project for the Office of Solid Waste in developing engineering analysis documents for several processes in the industrial organic chemicals manufacturing industry. Waste stream sources were identified and characterized, with particular emphasis towards hazardous waste sources. Mr. Zapkin was involved with the literature search, process analysis, draft report writing, and identification of data gaps phases of the program.

On a project for the California Air Resource Board, Mr. Zapkin served as a Sampling Crew Chief for the field testing of 59 cyclic steam injected wells in a program to monitor emissions for these wells. Various sampling and analytical methods were employed to determine VOC emission factors from well vents associated with thermally enhanced oil recovery.

While at Rensselaer Polytechnic Institute, Mr. Zapkin worked on developing an adjuvant to enhance the disinfection efficiency of chlorine at high pH. He also worked on an EPA-funded project to study microbial populations at different points within a water treatment plant using activated carbon for organic removal, and along its distribution system.

PROFESSIONAL/TECHNICAL SOCIETIES:

Water Pollution Control Federation.

Virginia Water Pollution Control Association.

American Water Works Association.

Society for Industrial Microbiology.

Sigma Xi, The Scientific Research Society.

ANDREW M. OVEN

EDUCATION:

M.S., Environmental Engineering, University of California, Berkeley, 1983.

B.S., Civil Engineering, Santa Clara University, Santa Clara, California, 1982.

EXPERIENCE:

Environmental Engineer, Radian Corporation, McLean, Virginia, 1983-Present.

RELEVANT EXPERIENCE:

Mr. Oven is currently involved in supporting three Record Searches for USAF installations. They are Phase I's of the DOD Installation Restoration Program (IRP) which is concerned with the scoping and alleviation of hazardous waste site problems on military bases.

During the past year, Mr. Oven has worked on a program for EPA's Effluent Guidelines Division (EGD) to develop effluent limitations guidelines for plants in the nonferrous metals manufacturing category. This task involved compilation of information on nonferrous metal manufacturing processes from literature, analyzing industry response to questionnaires, and evaluating available sampling data from selected individual facilities for 21 subcategories. He was involved with drafting technical supplements supporting proposed effluent limitations guidelines and standards for several of these subcategories. Finally, Mr. Oven was responsible for compiling the public record in support of the nonferrous metals manufacturing phase II regulation.

PROFESSIONAL/TECHNICAL SOCIETIES:

American Society of Civil Engineers.

LORI L. STOLL

EDUCATION:

M.S., Chemical Engineering, University of Wisconsin, Madison, Wisconsin, 1983.

B.S., Chemical Engineering, University of Wisconsin, Madison, Wisconsin, 1980.

EXPERIENCE:

Chemical Engineer, Radian Corporation, McLean, Virginia, 1983-Present.

Graduate Assistant, Department of Chemical Engineering, University of Wisconsin, Madison, Wisconsin, 1981-1983.

Teaching Assistant, Department of Chemical Engineering, University of Wisconsin, Madison, Wisconsin, 1980-1982.

Undergraduate Assistant, Department of Chemical Engineering, University of Wisconsin, Madison, Wisconsin, 1978-1980.

Pre-Professional Engineer, IBM, Rochester, Minnesota, Summer 1979.

RELEVANT EXPERIENCE:

Ms. Stoll is currently the chemical engineer for two USAF Phase I Record Searches. These analyze past hazardous waste disposal practices and their potential for release and/or migration of pollutants at USAF bases and properties.

Ms. Stoll is also assisting with estimation of VOC emissions from the commercial/residential sector as part of a project sponsored by the Department of Energy's interagency task force on acid rain.

Ms. Stoll recently took part in solid waste sampling efforts, part of a project aimed at solid waste characterization in the ferroalloy industry for EPA's Office of Solid Waste.

During the past year, Ms. Stoll has participated in several aspects of the development of effluent regulations in the nonferrous metals manufacturing industries, part of a project sponsored by EPA's Effluent Guidelines Division (EGD). Ms. Stoll is providing technical engineering support as required to EPA personnel on issues raised during litigation of the aluminum forming point source category effluent regulations. This work has included data evaluation, wastewater treatment technology evaluation, and data base development.

As a part of the same EGD project, Ms. Stoll has participated in efforts to develop estimates of the costs of compliance with proposed effluent regulations in the nonferrous metals manufacturing (phase I and phase II), nonferrous forming, aluminum forming, and metal molding and casting point source categories. Ms. Stoll has assisted with modifications to a computer cost model, data preparation, wastewater treatment system design, and preparation of a cost model user's manual. In addition, Ms. Stoll assisted in efforts to develop and revise pollutant removal estimates for the nonferrous metals manufacturing (phase II) and aluminum forming categories.

Ms. Stoll has also assisted in the development of the interim final effluent limitations guidelines for the aluminum forming point source category. In addition to those mentioned above, her responsibilities included assistance with revision of the development document and organization of technical documentation for inclusion in the public record.

Ms. Stoll assisted in the development of costs of compliance estimates for the lead subcategory of the battery manufacturing industry. She also organized cost model documentation for inclusion in the battery manufacturing public record.

At the University of Wisconsin, Ms. Stoll performed research on flow and solute transport in groundwater. Field tracer test data were used in a mathematical model to develop estimates of the groundwater velocity, dispersive mixing length, and porosity of an aquifer. Ms. Stoll was also involved in a study of the ventilation of the chemical engineering building. She conducted tracer tests and analyzed air samples via gas chromatography to determine the adequacy of the existing ventilation system.

While at IBM, Ms. Stoll conducted a designed experiment to characterize the operation of a disk lubricator, one step in the disk manufacturing process.

PROFESSIONAL/TECHNICAL SOCIETIES:

American Geophysical Union.

Tau Beta Pi.

APPENDIX B

List of Interviewees

(Base Personnel and Outside Agency Contacts)

BASE PERSONNEL

Organization	Shop Affiliation	Years at Newark AFS
AGMC	Safety Office	17
AGMC	Safety Office	12
AGMC	Directorate of Maintenance	21
AGMC	Physical Chemistry Lab	21
AGMC	Physical Chemistry Lab	22
AGMC	Inertial Engineering	18
AGMC	Facilities	18
AGMC	Missile Production Area	22
AGMC	Directorate of Maintenance	22
AGMC	Radiological Safety	18
AGMC	Materiel Control	18
AGMC	Plans and Programs	19
2803 ABG	Air Conditioning Plant	21
2803 ABG	Civil Engineering	11
2803 ABG	Fire Department	22
2803 ABG	Supply	21
2803 ABG	Mechanical Section	20
2803 ABG	Industrial Hygiene	2
2803 ABG	Heating Plant	18
2803 ABG	Supply	19
2803 ABG	Public Affairs	3
2803 ABG	Roads and Grounds	6
2803 ABG	Civil Engineering	22
2803 ABG	Entomology	12
2803 ABG	Carpenter Shop	10
2803 ABG	Civil Engineering	21
2803 ABG	Motor Pool	22
Retired	Operations and Maintenance	21
Retired	Heating Plant	15
Retired	Public Affairs	19
Retired	Technical Director	15
Retired	Civil Engineering	21
Retired	Civil Engineering	20
Retired	Heating Plant	21

OUTSIDE AGENCY CONTACTS

Name	Affiliation/Location
Lundy Adelsberger	Ohio EPA Division of Solid and Hazardous Waste Management, Columbus, Ohio
Zach Clayton	Ohio EPA Office of Emergency Response, Columbus, Ohio
Roger Hannahs	Ohio EPA Unregulated Sites Unit, Columbus, Ohio
Art Waldorf Leonard Harstine	Ohio Department of Natural Resources Division of Water, Columbus, Ohio
Horace Collins Dennis Hull	Ohio Department of Natural Resources Division of Geology, Columbus, Ohio
Dick Christman	Ohio Department of Natural Resources Division of Lands and Soils, Columbus, Ohio
Robert Parkinson	Ohio Soil Conservation Service, Newark, Ohio
	Licking County Planning Commission, Newark, Ohio
	Newark Area Chamber of Commerce, Newark, Ohio
Stan Holmquist Al Lallathin	City of Heath, Ohio

APPENDIX C

Hazard Assessment Rating Methodology
(HARM) Used on Newark AFS

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for six months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

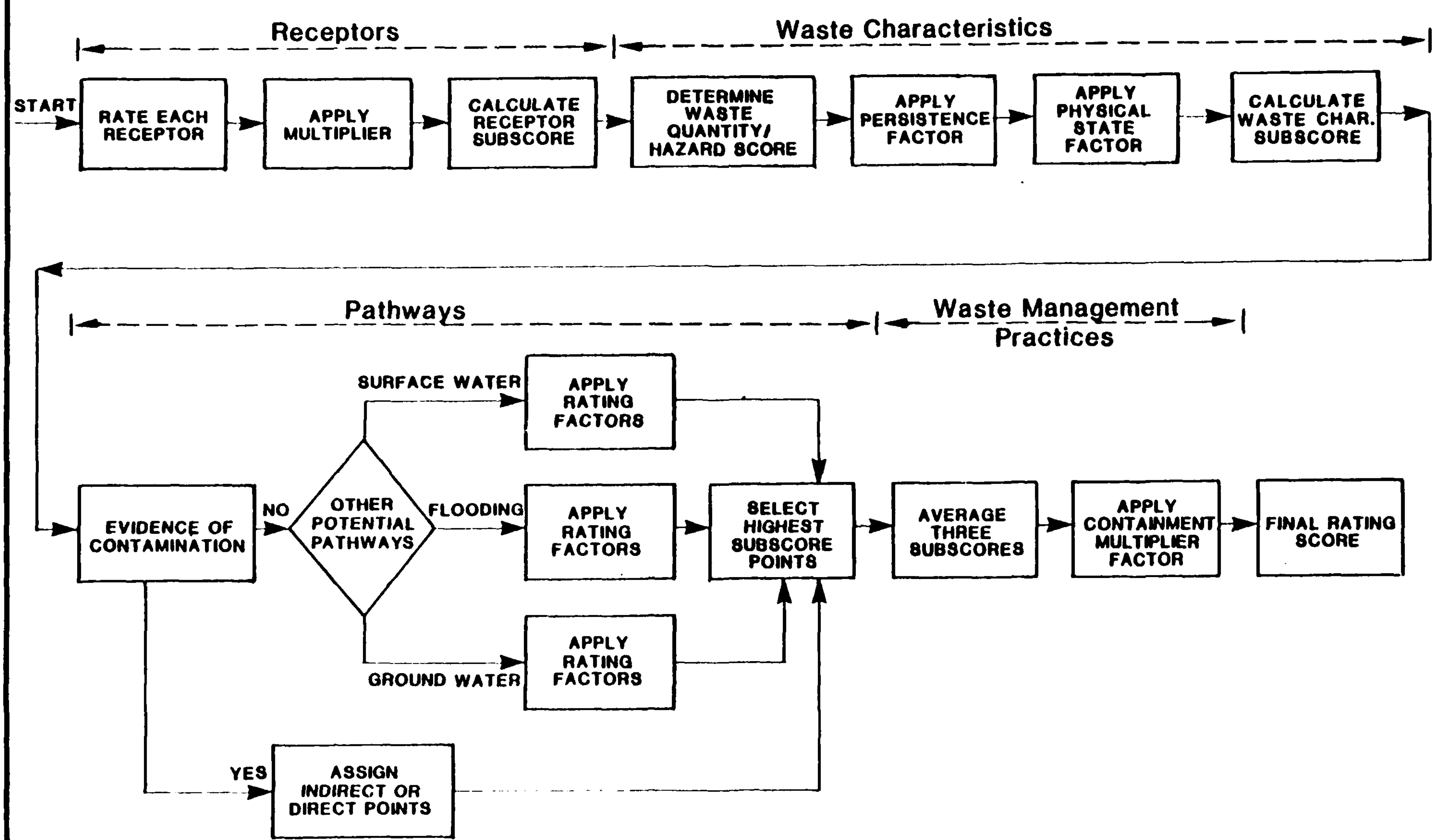
The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and groundwater migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by five percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART



HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______

2. Confidence level (C = confirmed, S = suspected) ______

3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

1. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (Thunderstorms)	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8

B-2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to + 20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($>10^{-2}$ cm/sec)	8

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX D

HARM Form for Rated Sites,
Newark AFS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site SP-3

LOCATION Along fence on southeast side of Building 4

DATE OF OPERATION OR OCCURRENCE 1973-1977

OWNER/OPERATOR NAFS

COMMENTS/DESCRIPTION

SITE RATED BY MAZ, AMO

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	85	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47.2

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	3	6	18	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	74	108

Subscore (100 X factor score subtotal/maximum score subtotal) 68.5

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0.0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	3	6	18	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	58	114

Subscore (100 x factor score subtotal/maximum score subtotal) 50.9

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 68.5

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	47.2
Waste Characteristics	100
Pathways	68.5

Total 215.7 divided by 3 = 71.9
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

71.9 x 1.0 = 71.9

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site SP-4

LOCATION West of installation near Visitors and Contractors Parking Area

DATE OF OPERATION OR OCCURRENCE 1973-1980

OWNER/OPERATOR NAFS

COMMENTS/DESCRIPTION Factor ratings determined from center of area

SITE RATED BY MAZ, AMO

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	85	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47.2

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	3	6	18	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	64	108

Subscore (100 X factor score subtotal/maximum score subtotal) 59.3

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0.0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	3	6	18	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	58	114

Subscore (100 x factor score subtotal/maximum score subtotal) 50.9

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 59.3

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	47.2
Waste Characteristics	100
Pathways	59.3

Total 206.5 divided by 3 = 68.8 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

68.8 x 1.0 = 68.8

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Site SP-1

LOCATION Northeast corner of Building 4

DATE OF OPERATION OR OCCURRENCE 1963-1965

OWNER/OPERATOR NAFS

COMMENTS/DESCRIPTION Current site of virgin freon storage tanks

SITE RATED BY MAZ, AMO, LLS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	85	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47.2

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	3	6	18	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	72	108

Subscore (100 X factor score subtotal/maximum score subtotal) 66.7

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0.0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	3	6	18	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	58	114

Subscore (100 x factor score subtotal/maximum score subtotal) 50.9

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 66.7

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	47.2
Waste Characteristics	60
Pathways	66.7

Total 173.9 divided by 3 = 58.0
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58.0 x 1.0 = 58.0

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Acid Storage Tank (Site AT-1)

LOCATION East Side Of Bldg. 4 Near Cooling Towers

DATE OF OPERATION OR OCCURRENCE March 1983 To Present

OWNER/OPERATOR NAFS

COMMENTS/DESCRIPTION Aboveground Tank

SITE RATED BY MAZ, AMO, LLS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	85	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47.2

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	3	6	18	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	66	108

Subscore (100 X factor score subtotal/maximum score subtotal) 61.1

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0.0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	3	6	18	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	58	114

Subscore (100 x factor score subtotal/maximum score subtotal) 50.9

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61.1

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	47.2
Waste Characteristics	60
Pathways	61.1

Total 168.3 divided by 3 = 56.1 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56.1 x 0.95 = 53.3

APPENDIX E

Master List of Shops

Newark AFS

Master List of Shops

Name	Symbol	Present Location (Bldg No)	Handle Hazardous Materials	Generate Hazardous Waste	Typical TSD Methods
AEROSPACE GUIDANCE & METROLOGY CENTER					
Command CC					
Commander	CC	2	No	No	--
Protocol	CCP	2	No	No	--
Historian	HO	2	No	No	--
Staff Judge Advocate	JA	2	No	No	--
Logistics Management LM					
Director Logistics Management	LM	4	No	No	--
Base Systems Division	LMB	4	No	No	--
Computer Operations Division	LMO	4	No	No	--
Resource Management Division	LMR	4	No	No	--
Technical Support Division	LMT	4	No	No	--
Quality Assurance	QA	2	No	No	--
Safety Office	SE	4	No	No	--
Social Actions Office	SL	4	No	No	--
Directorate of Maintenance MA					
Director	MA	4	No	No	--
Aircraft Product Division	MAB	4	Yes	Yes	Reuse/ DPDO
Missile Product Division	MAK	4	Yes	Yes	Reuse/ DPDO
Support Equipment Division	MAN	4	Yes	Yes	Reuse/ DPDO
Quality Assurance Division	MAQ	4	Yes	Yes	Reuse/ Consumed in Process/ DPDO

Production Resources Division	MAW	4	Yes	No	Consumed in Process/
		Directorate of Metrology ML			
Director	ML	4	No	No	--
Physical Metrology Division	MLD	4	No	No	--
Elecmech & Elec Metrology Division	MLE	4	No	No	--
Metrology Support Office	MLM	4	Yes	Yes	DPDO
Metrology Lab Evaluation Office	MLQ	4	No	No	--
Electromagnetic Metrology Division	MLR	4	No	No	--
Systems Metrology Division	MLS	4	No	No	--
		Directorate of Inertial Engineering SN			
Director	SN	4	No	No	--
Aircraft Inertial Engineering Division	SNA	4	No	No	--
Missile Inertial Engineering Division	SNM	4	No	No	--
Engineering Support Division	SNS	4	Yes	Yes	Reuse/ DPDO
		Plans and Programs XR			
Director	XR	2	No	No	--
Programs Division	XRP	2	No	No	--
Plans & Studies Division	XRS	2	No	No	--
		2803 AIR BASE GROUP			
		Command CC			
Commander	CC	2	No	No	--
Base Restaurant	CE	2	No	No	--
Base Exchange	CE	1	No	No	--
Consolidated Open Mess	CE	2	No	No	--
Military Personnel	DPM	2	No	No	--

		Comptroller AC			
Comptroller	AC	4	No	No	--
Budget & Mgt Analysis Branch	ACB	4	No	No	--
Accounting & Finance Branch	ACF	4	No	No	--
		Audiovisual Service Office AV			
Base Audiovisual Manager	AV	4	No	No	--
Photo Lab	AV	4	Yes	Yes	Silver Recovery
Illustrator	AV	4	No	No	--
		Administrative Division DA			
Chief	DA	4	No	No	--
Pub Documentation Branch	DAA	4	No	No	--
Publications/Forms Management	DAP	4	No	No	--
Reproduction	DAPJ	4	Yes	No	Consumed in Process
		Civil Engineering Division DE			
Chief	DE	4	No	No	--
Administrative Center	DEA	4	No	No	--
Engineering & Environmental Planning Branch	DEE	4	No	No	--
Fire Protection Branch	DEF	56	No	No	--
Industrial Engrg Ofc	DEI	4	No	No	--
Operation Branch	DEM	4	No	No	--
Protective Coating Unit	DEMMC	4	Yes	Yes	DPDO
Pavements & Grounds Unit (Entomology)	DEMMG	20	Yes	No	Consumed In Process
Systems Management Section	DEMD	4	No	No	--
Electrical Section	DEME	4	No	No	--
Mechanical Section	DEMM	4	No	No	--

Equipment Maintenance Unit	DEMME	4	Yes	No	Consumed in Proces
Heating Systems Unit	DEMMH	4	Yes	No	Consumed in Proces
Refrig & Air Condition Unit	DEMMR	4	Yes	No	Consumed in Proces
Resources & Requirements Branch	DER	4	No	No	--
Supply & Transportation Division DM					
Chief	DM	4	No	No	--
Customer Support Branch	DMSC	4	No	No	--
SCARS	DMSA	4	No	No	
Material Storage & Distribution	DMSD	4	Yes	No	Handling Only
Material Management Branch	DMSM	4	No	No	--
Management Procedures Branch	DMSP	4	No	No	--
Supply Systems Branch	DMSS	4	No	No	--
Transportation Officer	DMT	4	No	No	--
Packing & Preservation Section	DMTP	4	Yes	No	Handling Only
Transportation Services Section	DMTT	4	Yes	No	Handling Only
Civilian Personnel	DPC	2 & 4	No	No	--
Disaster Preparedness Office	DW	4	No	No	--
Public Affairs Office	PA	2	No	No	--
Contracting Division	PM	2	No	No	--
Security Police Division	SP	2	No	No	--
OL D 2046 Communications Group	AFCC	4	No	No	--
Office of Special Investigation	OSI	2	No	No	--
Dispensary	SGPCO	1	No	No	--
Det 7 3025 Mgmt Engrg Sq	3025 MES	55	No	No	--
Defense Contract Admin Services	DCAS	4	No	No	--

APPENDIX F

Inventory of POL Storage Tanks
on Newark AFS

STORAGE TANKS OF LESS THAN 1,000 GALLONS CAPACITY

Facility, Building, or Site Number	Product	Capacity (gal)	Description[a]
Site KT-1	Kerosene	275	AG, H, W, IS
Building 4 (Room 41T11B)	Diesel fuel	275	AG, H, W, IS
Facility 42	Leaded gasoline	550	BG, H, W, IS

[a]AG - Above ground
BG - Below ground
H - Horizontal cylinder
W - Welded steel
IS - In service

Source: NAFS Ground Fuels Storage and Requirement Information, June, 1984.

STORAGE TANKS OF 1,000 - 10,000 GALLONS CAPACITY

Facility, Building, or Site Number	Product	Capacity (gal)	Description[a]
Facility 42	Diesel fuel	3,000	BG, H, W, IS
Site DT-1	Diesel fuel	3,000	BG, H, W, IS
Facility 42	Unleaded gasoline	3,000	BG, H, W, IS
Facility 42A	Unleaded gasoline	3,000	BG, H, W, OS
Facility 83A	Virgin Freon 113	3,000	AG, H, W, IS
Facility 83A	Virgin Freon 113	4,500	AG, H, W, IS

[a]BG - Below ground
AG - Above ground
H - Horizontal cylinder
W - Welded steel
IS - In service
OS - Out of service

Source: NAFS Ground Fuels Storage and Requirement Information, June, 1984.

STORAGE TANKS OF GREATER THAN 10,000 GALLONS CAPACITY

Facility, Building, or Site Number	Product	Capacity (gal)	Description[a]
Facility 41	Propane	90,000	BG, H, W, IS
Facility 41	Propane	90,000	BG, H, W, IS
Facility 89	Heating Number 2 Fuel Oil	20,000	BG, H, O, IS

[a]BG - Below ground
H - Horizontal cylinder
W - Welded steel
O - Other construction
IS - In service

Source: NAFS Ground Fuels Storage and Requirement Information, June, 1984.

APPENDIX G

Supplemental Environmental Data

U.S. GEOLOGICAL SURVEY
CENTRAL LABORATORY
ATLANTA. GEORGIA 30340

WATER ANALYSIS
ID # 211307

2803 ABG/DEOMH NEWARK AF STATION NEWARK OH 43055. HQ AFLC DEMU
WRIGHT-PATTERSON AFB OH 43433 BLDG 2 WATER SYSTEM, KITCHEN TAP.
DATE: 76-06-16. TIME: 1300, APPEARANCE OF SAMPLE CLEAR, TEMP 72

RESULTS OF ANALYSIS

MAJOR IONS

CATIONS	MG/L	ME/L	ANIONS	MG/L	ME/L
CALCIUM	21	1.048	BICARBONATE	361	5.917
MAGNESIUM	11	0.905	CARBONATE	0	0.000
SODIUM	110	4.785	SULFATE	22	0.458
POTASSIUM	1.5	0.038	CHLORIDE	18	0.508
			FLUORIDE	0.9	0.047
			NO2 + NO3 AS N	0.01	0.001

ADDITIONAL CONSTITUENTS

			DISSOLVED SOLIDS		
SILICA	MG/L	11	RESIDUE AT 180 C	MG/L	356
IRON	MG/L	0.53	CALCULATED (SUM)	MG/L	374
MANGANESE	MG/L	0.26	HARDNESS AS CACO3		
COLOR		0	TOTAL	MG/L	98
PH			NON-CARBONATE	MG/L	0
SPECIFIC CONDUCTANCE			ALKALINITY AS CACO3	MG/L	296
IN UMHOS AT 25 C			CARBON DIOXIDE(CALC)	MG/L	
			SODIUM ADSORP. RATIO		4.8
			LANGELIER INDEX --		

U.S. GEOLOGICAL SURVEY
CENTRAL LABORATORY
ATLANTA, GEORGIA 30340

WATER ANALYSIS
ID # 211310

2803 ABGAR5645F 556192 AF STAT96N NEWARK OH 43055, HQ AFLC/DEMU
WRIGHT-PATTERSON AFB OH 43433, WELL #1, 76-06-16, 1100, GW-WELL.
APPEARANCE OF SAMPLE CLEAR TEMP 58, DOSSOLVED OXY. 0, PH 7.7

RESULTS OF ANALYSIS

MAJOR IONS

CATIONS	MG/L	ME/L	ANIONS	MG/L	ME/L
CALCIUM	75	3.743	BICARBONATE	312	5.114
MAGNESIUM	27	2.221	CARBONATE	0	0.000
SODIUM	20	0.870	SULFATE	36	0.749
POTASSIUM	1.6	0.041	CHLORIDE	33	0.931
			FLUORIDE	1.0	0.053
			NO2 + NO3 AS N	1.40	0.100

ADDITIONAL CONSTITUENTS

			DISSOLVED SOLIDS		
SILICA	MG/L	12	RESIDUE AT 180 C	MG/L	358
IRON	MG/L	2.1	CALCULATED (SUM)	MG/L	365
MANGANESE	MG/L	0.06	HARDNESS AS CACO3		
COLOR		0	TOTAL	MG/L	300
PH			NON-CARBONATE	MG/L	43
SPECIFIC CONDUCTANCE			ALKALINITY AS CACO3	MG/L	256
IN UMHOS AT 25 C			CARBON DIOXIDE (CALC)	MG/L	
			SODIUM ADSORP. RATIO		0.5
			LANGELIER INDEX --		

U.S. GEOLOGICAL SURVEY
CENTRAL LABORATORY
ATLANTA, GEORGIA 30340

WATER ANALYSIS
ID # 211308

2803 ABG/DEOMH NEWARK AF STATION NEWARK OH 43055 HQ AFLC/DEMU WRIGHT-PATTERSON AFB, OH 43433, WELL #2 76-06-16, TIME: 1000, APPERANCE CLEAR TEMP 60, DISSOLVED OXY. 1.9, PH 7.7

RESULTS OF ANALYSIS

MAJOR IONS

CATIONS	MG/L	ME/L	ANIONS	MG/L	ME/L
CALCIUM	69	3.443	BICARBONATE	391	6.408
MAGNESIUM	27	2.221	CARBONATE	0	0.000
SODIUM	33	1.435	SULFATE	18	0.375
POTASSIUM	1.6	0.041	CHLORIDE	8.6	0.243
			FLUORIDE	0.8	0.042
			NO2 + NO3 AS N	2.90	0.207

ADDITIONAL CONSTITUENTS

			DISSOLVED SOLIDS		
SILICA	MG/L	9.8	RESIDUE AT 180 C	MG/L	360
IRON	MG/L	3.4	CALCULATED (SUM)	MG/L	373
MANGANESE	MG/L	0.04	HARDNESS AS CACO3		
COLOR		0	TOTAL	MG/L	280
PH			NON-CARBONATE	MG/L	0
SPECIFIC CONDUCTANCE			ALKALINITY AS CACO3	MG/L	321
IN UMHOS AT 25 C			CARBON DIOXIDE(CALC)	MG/L	
			SODIUM ADSORP. RATIO		0.9
			LANGELIER INDEX --		

U.S. GEOLOGICAL SURVEY
CENTRAL LABORATORY
ATLANTA, GEORGIA 30340

WATER ANALYSIS
ID # 211315

2803 ABG/DEOMH NEWARK AFS NEWARK, OH 43055 HQ AFLC/DEMU WRIGHT-PATTERSON AFB OH 43433 WELL #3 76-06-16 1500 GW WELL CLEAR TEMP 61 DO 1.8 PH 7.8

RESULTS OF ANALYSIS

MAJOR IONS

CATIONS	MG/L	ME/L	ANIONS	MG/L	ME/L
CALCIUM	68	3.393	BICARBONATE	386	6.327
MAGNESIUM	27	2.221	CARBONATE	0	0.000
SODIUM	27	1.174	SULFATE	11	0.229
OTASSIUM	1.5	0.038	CHLORIDE	9.8	0.276
			FLUORIDE	0.9	0.047
			NO2 + NO3 AS N	0.06	0.004

ADDITIONAL CONSTITUENTS

			DISSOLVED SOLIDS		
SILICA	MG/L	9.8	RESIDUE AT 180 C	MG/L	346
IRON	MG/L	2.6	CALCULATED (SUM)	MG/L	346
MANGANESE	MG/L	0.03	HARDNESS AS CACO3		
COLOR		0	TOTAL	MG/L	280
PH			NON-CARBONATE	MG/L	0
SPECIFIC CONDUCTANCE			ALKALINITY AS CACO3	MG/L	317
IN UMHOS AT 25 C			CARBON DIOXIDE(CALC)	MG/L	
			SODIUM ADSORP. RATIO		0.7
			LANGELIER INDEX --		

APPENDIX H

Glossary

(Including Acronyms and Abbreviations Used in the Text)

GLOSSARY

List of Acronyms, Abbreviations, and Symbols Used in the Text

AFESC	Air Force Engineering and Services Center
AFLC	Air Force Logistics Command
AFS	Air Force Station
AG	Above Ground
AGMC	Aerospace Guidance and Metrology Center
BG	Below Ground
CE	Civil Engineering
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CHEM LAB	Physical Chemistry Laboratory
DCSC	Defense Construction Supply Center
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DMINS	Dual Miniature Inertial Navigation System
DMSO	Dimethyl Sulfoxide
DOD	Department of Defense
DPDO	Defense Property Disposal Office
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
FREON	Freon 113; trichlorotrifluoroethane
gal/yr	Gallons Per Year
GCA	Guidance Control Assembly
GC/MS	Gas Chromatography/Mass Spectrometry
HARM	Hazard Assessment Rating Methodology
ICBM	Intercontinental Ballistic Missile
IM/SM	Item Manager/System Manager
IR	Infrared
IRP	Installation Restoration Program
MOGAS	Motor Gasoline
NAFS	Newark Air Force Station
No.	Number
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission

PCBs	Polychlorinated Biphenyls
PMEL	Precision Measurement Equipment Laboratory
POL	Petroleum, Oil, and Lubricants
ppm	Parts Per Million
psi	Pounds Per Square Inch
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
SRAM	Short Range Attack Missile
TOC	Total Organic Carbon
TRC	Technology Repair Center
USAF	United States Air Force
UV	Ultraviolet

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater to yield economically significant quantities of groundwater to wells and springs.

AQUIFER YIELD - Maximum rate of withdrawal of water from an aquifer.

DISCHARGE - The process involved in the draining or seepage of fluid out of a lake, pipe, groundwater aquifer or similar fluid containing structure.

GROUNDWATER - All subsurface water, especially that part that is in the zone of saturation.

HAZARDOUS WASTE - a solid waste which because of its quantity, concentration, or physical, chemical or infectious characteristics may--

(A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible, illness; or

(B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

LEACHATE - a solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water.

LEACHING - the process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

LINER - a continuous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate.

MIGRATION (Contaminant) - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

NET PRECIPITATION - Mean annual precipitation minus mean annual evapotranspiration.

OIL/WATER SEPARATOR - A man-made facility designed to separate by gravity liquids of differing densities; typically to skim oil or grease from a water surface.

PCB (Polychlorinated Biphenyl) - A chemically and thermally stable toxic organic compound that, when introduced into the environment, persists for long periods of time, is not readily biodegradable, and is biologically accumulative.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

RECHARGE - The process involved in the addition or replenishment of water to a groundwater aquifer by natural or artificial processes.

STILL - Distillation tower.

SURFACE WATER - All water exposed at the ground surface; including streams, rivers, ponds, and lakes.

WATER TABLE - The upper limit of the portion of the ground wholly saturated with water.

APPENDIX I

References

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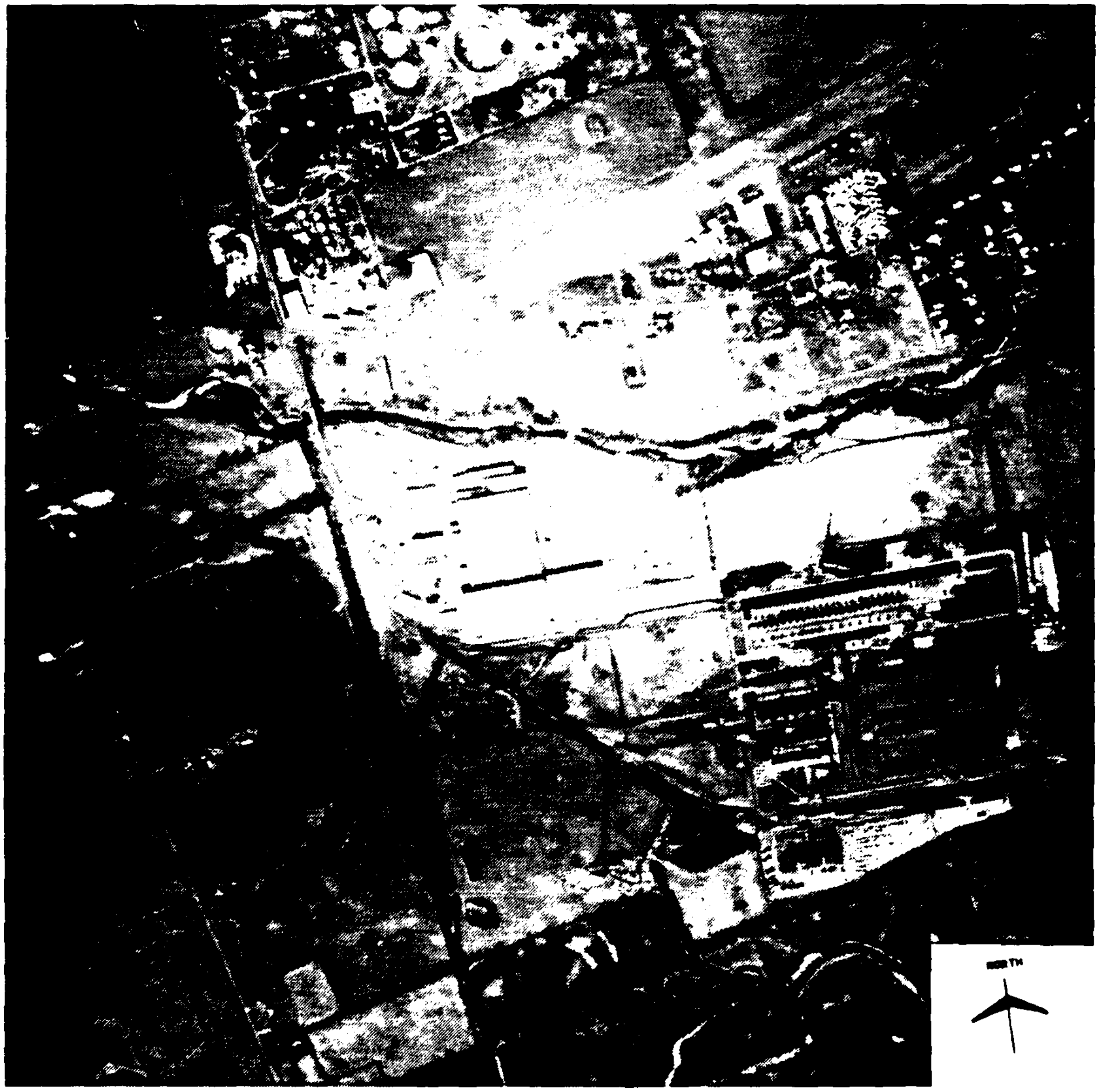
APPENDIX J

Aerial Photograph

Newark Air Force Station



AERIAL VIEW OF NEWARK AIR FORCE STATION (2 March 1983)

Building 4 is in the center of the photo with Ramp Creek to the north, Kaiser Aluminum Extrusion plant to the southeast and farm land to the west. Also visible in the photograph is the Byerlite asphalt plant north of Ramp Creek, the old Pureoil Refinery north of the asphalt plant, the Licking County airport east of the asphalt plant and a residential area east of the airport.